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THESIS

ANALYSIS OF ADVANCEMENT AND ATTRITION IN THE MILITARY CEREMONIAL UNITS

by

Elizabeth S. Hostetler

September, 1997

Thesis Advisor: Robert R. Read
Second Reader: Samuel E. Buttrey

Thesis
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The Navy's Ceremonial Guard, the Air Force Honor Guard, the Army's Old Guard and the Marine Barracks, Washington are specially dedicated units that provide ceremonial personnel for official functions including funeral details, foreign dignitary arrivals, color guards and drill teams. The majority of the members are volunteers selected from recruit training or the immediate follow-on training to begin a two to three year tour with the appropriate ceremonial unit while putting their normal career progression on hold.

Information on individuals who entered the military service during fiscal years 1986 to 1995 and were assigned to one of the ceremonial units was collected. The distribution of the time required to advance from paygrade E3 to E4, from E4 to E5 and from E5 to E6 as well as attrition (voluntary or involuntary) from the same paygrades for the ceremonial members was compared to the same information from service specific comparative random samples. The analysis seeks and details any effects on a service member's career for time spent with a ceremonial unit. The most conspicuous conclusion was that Navy Ceremonial Guard members in paygrade E3 had a higher attrition rate, a lower advancement rate and took longer to attain their advancements to paygrade E4 than did their random sample counterparts. Affects for other service and paygrade combinations appear relatively insignificant.

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ANALYSIS OF ADVANCEMENT AND ATTRITION IN THE MILITARY CEREMONIAL UNITS

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Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN OPERATIONS RESEARCH

from the

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ABSTRACT

The Navy's Ceremonial Guard, the Air Force Honor Guard, the Army's Old Guard and the Marine Barracks, Washington are specially dedicated units that provide ceremonial personnel for official functions including funeral details, foreign dignitary arrivals, color guards and drill teams. The majority of the members are volunteers selected from recruit training or the immediate follow-on training to begin a two to three year tour with the appropriate ceremonial unit while putting their normal career progression on hold.

Information on individuals who entered the military service during fiscal years 1986 to 1995 and were assigned to one of the ceremonial units was collected. The distribution of the time required to advance from paygrade E3 to E4, from E4 to E5 and from E5 to E6 as well as attrition (voluntary or involuntary) from the same paygrades for the ceremonial members was compared to the same information from service specific comparative random samples. The analysis seeks and details any effects on a service member's career for time spent with a ceremonial unit. The most conspicuous conclusion was that Navy Ceremonial Guard members in paygrade E3 had a higher attrition rate, a lower advancement rate and took longer to attain their advancements to paygrade E4 than did their random sample counterparts. Affects for other service and paygrade combinations appear relatively insignificant.

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EXECUTIVE SUMMARY

The Navy's Ceremonial Guard, the Air Force Honor Guard, the Army's Old Guard and the Marine Barracks, Washington are specially dedicated units that provide ceremonial personnel for official functions including funeral details, foreign dignitary arrivals, color guards and drill teams. The majority of the members are volunteers selected from recruit training or the immediate follow-on training to begin a two to three year tour with the appropriate ceremonial unit while putting their normal career progression on hold. This study, requested by Commanding Officer, Naval Station Washington, explores whether a tour with a ceremonial unit has an impact on enlisted career progression measured in terms of success or failure of the seaman, airman, marine or soldier after they leave the ceremonial unit.

The data used in this study was extracted from the Defense Manpower Data Center Special Cohort Accession and Continuer database for fiscal years 1986 to 1995. This database tracks every enlisted member of the Army, Navy, Air Force and Marine Corps who enters active duty during a given fiscal year. For each guard member, the selected data record included the date of birth, education level, gender, race, Armed Forces Qualification Test (AFQT) results, height, weight, entry date, entry paygrade, loss date, loss paygrade, and loss character of service. Additionally, each record contained quarterly and semiannual updates that included paygrade, date of rank, education level, and Unit Identification Code (UIC). The database had been updated to reflect service member status up to and including December 1996. The "non-ceremonial" personnel from each service were sampled in order to generate a basis for comparison. The sampling was at random but stratified to the most frequently occurring guard member profile for that service in terms of age at entry, AFQT category, height and weight.

For each service member in either the ceremonial unit or the comparison sample, the entry date and dates of first advancement to paygrades E3, E4, E5 and E6 were determined and converted to the number of months from the base date of January 1985 to the date of interest. For each service and paygrade combination, the number of months spent in each paygrade for the guard and comparison sample groups were placed in a data base and analyzed for common distributions. Attrition rate comparisons were made as well.

Across the four services, Army, Navy, Air Force and Marine Corps and across the three advancement windows, paygrade E3 to E4, paygrade E4 to E5, and paygrade E5 to

E6, only one group of service members seemed to be sharply impacted by time spent with a ceremonial unit. Navy service members in paygrade E3 have a lower advancement percentage and a higher attrition percentage. Further, the distribution of time required to advance from paygrade E3 to paygrade E4 is not the same for the Navy's Ceremonial Guard members and the comparative random sample. The indication is that the Navy Ceremonial Guard members who do get advanced to paygrade E4 take longer to attain that paygrade.

For all other service and paygrade combinations, the effects of time spent in the ceremonial unit exhibited occasional statistical significance, yet the effects were small and operational impact hardly detectable. For all advancement processes studied, the distributions of time to advance have essentially the same shape and spread with the centers, or average time to be advanced, displaced by amounts ranging from -3 to 2 months. The only exception to the similar spread conclusion is the Marine Corps advancement from paygrade E3 to paygrade E4. The indication is that, on the average, members of the Marine Barracks, Washington are advanced to paygrade E4 faster than their comparison sample counterparts. Further, other than Navy advancements from paygrade E3 to E4 mentioned above, service members who spend a tour with a ceremonial unit consistently have higher advancement percentages and lower attrition percentages compared to their random sample counterparts.

Thus, other than Navy Ceremonial Guard and Marine Barracks, Washington members in paygrade E3, there is apparently no perceptible impact on a service member's career for time spent with a ceremonial unit.

I. INTRODUCTION

A. GENERAL

The United States Navy's Ceremonial Guard, a component of Naval District Washington, is an official ceremonial unit of the Navy and as such is a Presidential Support Activity. The following analysis, requested by the Commanding Officer, Naval Station Washington explores whether a tour with the Ceremonial Guard has an impact on enlisted career progression. The study includes data on personnel who joined the Army, Navy, Air Force or Marine Corps between fiscal year 1986 and fiscal year 1995 inclusive and compares advancement and attrition between the members of the ceremonial units and representative samples from each respective service.

B. BACKGROUND

The Army, Navy, Air Force and Marines each have specially dedicated units that provide ceremonial personnel for official functions. Ceremonial functions performed include funeral details, foreign dignitary arrivals, color guards and drill teams. The units referred to are the Army's Old Guard, the Marine Barracks, Washington, the Navy's Ceremonial Guard and the Air Force Honor Guard. All four units are located in Washington, DC.

The structure of the ceremonial units varies significantly by service; however, they all have similar criteria for selection. Ceremonial personnel must meet minimum height requirements, have outstanding personal appearance and military bearing, and be able to perform ceremonies without glasses. The member must also be a good candidate for obtaining a Single Scope Background Investigation for a top secret clearance and White House Access, Category II. In general, the service member's records are screened to ensure that he or she is a United States citizen, has no record of civil or military convictions other than minor traffic violations, and no record of financial instability or irresponsibility. The majority of members are selected either from recruit training or during the immediate follow-on training to begin a two- to three-year tour with the appropriate ceremonial unit while putting their normal career progression on hold.

The Commanding Officer, Naval Station Washington has requested a study comparing the Navy's policies with respect to its Ceremonial Guard to those of the other

services as measured in terms of the eventual success or failure of the sailors, marines, airmen, and soldiers after they leave the ceremonial unit. This result would provide the Navy with insight and guidance on how to best serve this particular segment of junior sailors.

C. SERVICE POLICIES

Upon arrival at a ceremonial unit, the service member undergoes dedicated training in ceremonial customs, courtesy and uniform maintenance. The training lasts from three to eight weeks depending on the service. The standard tour for members selected from Recruit Training is two years; however, most services end up maintaining a first term member with a three year service obligation until the obligation is complete. Service unique procedures are detailed below.

1. US Navy (Ceremonial Guard)

The Ceremonial Guard is comprised of 165 members with the majority of E3 and below members selected from Recruit Training. All ratings are eligible for selection; however, service members selected must sign a Page 13 entry agreeing to delay any guaranteed "A" schools. Billets recruited directly from the fleet include one E8, two E7s, nine ceremonial and six support petty officers (E4/5/6). Recently, the number of senior enlisted and petty officer billets have been increased to provide additional leadership both on and off the parade field. Minimum height requirements are 72 inches for males and 70 inches for females and petty officers. Members selected to fill support billets are not required to be ceremonially screened. The guard currently contains approximately 10% women which is reflective of the Navy overall. The command sends guard members on Temporary Active Duty (TAD) to various ships in Norfolk, VA and to commands in the local Washington area for rate training and to obtain personal advancement rating signatures (PARS). The members are encouraged to study for their appropriate rating exams in order to advance to paygrade E4; however, members desiring to enter a rating that requires "A" school attendance prior to advancement to E4 are not able to advance during their time in the Guard.

2. US Marine Corps (Marine Barracks, Washington)

Marine Barracks, Washington is composed of approximately 1200 members. They are charged with providing members for official ceremonies, including the Drum and Bugle Corps and the Silent Drill Team, providing security forces for Camp David and the Naval Academy, and maintaining the Marine Corps Institute. Companies A and B, each consisting of 120-140 members, provide the ceremonial aspects similar to the Navy's Ceremonial Guard. The E3 and below members are selected from the Schools of Infantry (SOI) located at Camp Lejeune and Camp Pendelton while E4 and above personnel are selected from individual units within the Fleet Marine Force. Since the members must have the infantryman military operation specialty (MOS) and because of the additional mission of being a deployable unit, only men are selected. The minimum height requirement is 70 inches. Members that qualify for the Silent Drill Team are sometimes allowed to extend their tour length for up to one year. The ceremonial members are sent TAD to Quantico, VA for training and experience as infantrymen in an operational battalion. There were 52 training support requests filled from January to November 1996 allowing the ceremonial members to spend about one-fourth of their time in the field gaining MOS experience.

3. US Army (The Old Guard)

The Old Guard is composed of about 1240 members; approximately 800 are involved in the ceremonial duties and the rest compose the support staff. All members assigned to the Old Guard must be ceremonially screened and are used as back-up members for large ceremonies and/or busy days. The majority of the members are infantrymen; however, other MOSs are accepted for support services. Since 1994, women have been selected to fill a Military Police (MP) platoon and do assist with ceremonial duties. The minimum height requirement is 70 inches for both males and females. The standard tour length for E3 and below is 30 months and for E4 and above is 36 months. MOS training is conducted locally (common task training) and also through TAD assignments to Fort Polk, LA, Fort Sherman, Panama and the National Training Center, Fort Irwin, CA.

4. US Air Force (Honor Guard)

The Honor Guard is composed of 165 members. The Guard prefers to select its members from the career field. However, due to the recent downsizing, the career fields have not supported release of their members to the Honor Guard forcing the Guard to select a larger percentage from Basic Military Training (BMT). The initial training for the Honor Guard is an official technical school resulting in MOS 8G000. While assigned to the Honor Guard, members compete only with other guard members for advancement. The usual rating exam is waived leaving only the Promotion Fitness Exam; however, the result is advancement in the member's original rating. The Honor Guard currently consists of about 10% women which is representative of the rest of the Air Force, given the height requirement. The USAF has had to reduce the minimum height requirement for both males and females to 68 inches in order to fill all billets. Honor Guard duty is considered Special Duty and is available to all rates except those with critical manning. The Honor Guard members receive little or no rate training during their time with the Guard because the rating exams have been waived. However, when time and manning permit, for about one month before a member transfers from the Guard, he or she receives on the job training to get back up to speed in the appropriate rating. Current tour length in the Guard is two years for members straight from basic training. The Honor Guard is trying to get the tour length extended to 30 months due to time required to process security clearances. For members from the career fields, the tour length is also two years but can be extended for one year a maximum of two times. Time spent in the Honor Guard opens opportunities to change rate and apply for instructor duty, officer selection or both. Repeat tours are permitted on a case by case basis.

D. PROBLEM STATEMENT AND APPROACH

Using data from the Defense Manpower Data Center (DMDC), this thesis has as its goal the analysis of the time between advancements in paygrade and the overall attrition rates of ceremonial unit personnel compared to comparative random samples from each service to determine any effects of time spent with a ceremonial unit.

To accomplish the goals stated here, the number of months required to advance from paygrade E3 to paygrade E4, from paygrade E4 to paygrade E5 and from paygrade E5 to paygrade E6 were calculated for each service member as appropriate. These calculations could only be conducted for service members who actually attained the higher

paygrade; therefore, the sample sizes decreased as the paygrade increased due to the use of cohort data. Simultaneously, the attrition rates from each paygrade were monitored. The attrition rates used for comparison were also conditioned upon the service member attaining a specified paygrade before leaving the service. The distributions of the time required to advance for each paygrade and the overall attrition rates from each paygrade for the ceremonial units were compared to those of the non-ceremonial samples.

E. THESIS ORGANIZATION

Chapter II gives an overview of the data used to conduct this thesis. Chapter III details the methodology of the analysis. Chapter IV contains the analysis in full detail while Chapter V summarizes the final results and provides conclusions and recommendations for further study. The appendices are used to provide additional graphs and information that support Chapter IV.

II. DATA

A. SCOPE OF THE STUDY

This study covers members of the Army, Navy, Air Force and Marine Corps ceremonial units from cohort year 1986 to cohort year 1995 as well comparative random samples drawn from each service for the same time frame. The United States Coast Guard also has a ceremonial unit; however, the Coast Guard falls under the purview of the Department of Transportation and not the Department of Defense. The data for the Coast Guard members was not available from Defense Manpower Data Center (DMDC).

B. THE DATABASE

The data used in this study was extracted from the DMDC Special Cohort Accession and Continuer (DSCAC) database for fiscal years 1986 to 1995. This database tracks every enlisted member of the Army, Navy, Air Force and Marine Corps who enters active duty during a given fiscal year. The database is broken into four sections described as follows. The MEPCOM section contains information about each member at his or her time of entry onto active duty. Since a service member can leave and return to active duty more than once in a career, the LOSS section contains information about the member's first loss after entry onto active duty. The FLAGS section contains information useful for cross checking data. The final section is the ACTIVE DUTY ENLISTED MASTER INVENTORY section. This section contains blocks of information on each member for each quarter for 21 quarters (four and one half years) and for each half-year thereafter for up to 20 years total. The database had been updated to reflect service member status up to and including December 1996. If an advancement or attrition had not occurred by this date, the individual was considered censored and treated separately from the previous two groups.

Members of each service's ceremonial unit were identified by locating the appropriate Unit Identification Code (UIC) in their record. The UICs searched for were A4AAA for the Army, FWCZ for the Air Force, 30027 for the Navy and 54900 for the Marine Corps. Use of the UIC for selection of guard members resulted in administrative support staff members being selected also. Based on requirements that the majority of support staff also be ceremonially screened and used in ceremonies as needed, it was not

felt that inclusion of these members diluted the data. The search for and selection of the guard members was conducted by DMDC and the resulting data files were downloaded to the Naval Postgraduate School AMDAHL Model 5995 mainframe computer. MVS SAS Release 6.07 code was used to extract the appropriate variables from the original DMDC DSCAC file. Output from the SAS code was converted to an Microsoft EXCEL 6.0 file and imported into S+ for computations. Approximately 1% of the records did not convert properly between these systems and were deleted.

C. RANDOM SAMPLE GENERATION

For each guard member, the selected data record included data on date of birth, education level, gender, race, Armed Forces Qualification Test (AFQT) results, height, weight, entry date and entry paygrade. The loss information extracted contained the loss date, loss paygrade, and loss character of service. The inventory data used consisted of paygrade, date of rank, education level, and UIC for each quarterly or semiannual update.

As it was infeasible to compare each service's ceremonial unit members to the entire remainder of that service, a random sample was selected from that remainder. The sample was chosen to match the most frequently occurring guard member profile and served to reduce the massive amount of data to a useable size. To generate the sample, the records of all guard members were separated by service to determine the parameters for random sample selection. The service groups were analyzed to determine the most frequently occurring values of several variables. The deciding factors were age at entry (18 to 21 years inclusive), AFQT category (II, IIIa and IIIb), height (greater than or equal to 69 inches) and weight (corresponding to minimum and maximum guard member weight for that height). The random sample was generated through the use of SAS code that compared the above requirements with every member of each cohort year. From the 15,000 to 25,000 eligible matches per service per year, a SAS code selected 2,500 eligible Marines, 2,500 eligible Army members, and 400 members from each of the Air Force and Navy at random. The size of the random sample selected for each service for each year corresponded to twice the number of guard members normally assigned to the ceremonial unit. This value was increased to anticipate data that would not convert correctly between programs. Any guard personnel that were selected into the random sample were removed. The SAS code also extracted the same variables per record as had been extracted for the guard members.

D. PROBLEMS WITH THE DATA SET

As mentioned previously, approximately 1% of data records did not convert properly between programs and were deleted from consideration. Attempts were made to salvage the data through record by record study. If it could be determined that important information was missing or if unambiguous corrective action was not possible, the record could not be returned to the file. For records that contained incorrect data, if the correct information was available and verifiable elsewhere in the record, the data were corrected; otherwise the record was deleted. The most frequent missing entries were the loss dates and the date of rate advancement when the individual was within several months of leaving the service. Similarly, the most frequent incorrect entries were the dates of rate for an advancement. Repeatedly, the dates were not entered in a timely fashion; often they were not updated for several quarters. If the correct date of rate could be identified, the record was corrected. Another complicating factor was that of service members having broken service. When located, these records were deleted because re-entry and subsequent advancement rates did not follow the patterns of service members with continuous service.

III. METHODOLOGY

A. INITIAL CALCULATIONS

For each service member, the entry date and dates of first advancement to paygrades E3, E4, E5 and E6 were determined and converted to the number of months from the base date of January 1985 to the date of interest. Thus, the numbers of months calculated ranged from zero (member did not attain that paygrade) to 144 (member attained that paygrade in December 1996.) Due to staggered entry dates, there was much censoring; not all members were eligible for advancement to the mentioned paygrades. Paygrade E7 was not included due to the small percentage of personnel achieving that paygrade.

For the time period covered by the data set, the possible career progressions are shown in Figure 3.1. The majority of service members entered in paygrades E1, E2, or E3 and then were advanced or reduced in rank as appropriate. Attrition could occur from any paygrade due to the end of a member's enlistment contract, voluntary separation (e.g. the drawdown in service size) or involuntary separation (e.g. disciplinary or administrative separations). For this study, reductions in rate were not tracked. Since a main objective was to determine how long it took to obtain the next higher paygrade, personnel who suffered a reduction in rate were treated as if no change took place; they were simply attributed a longer time to advance to the next paygrade.

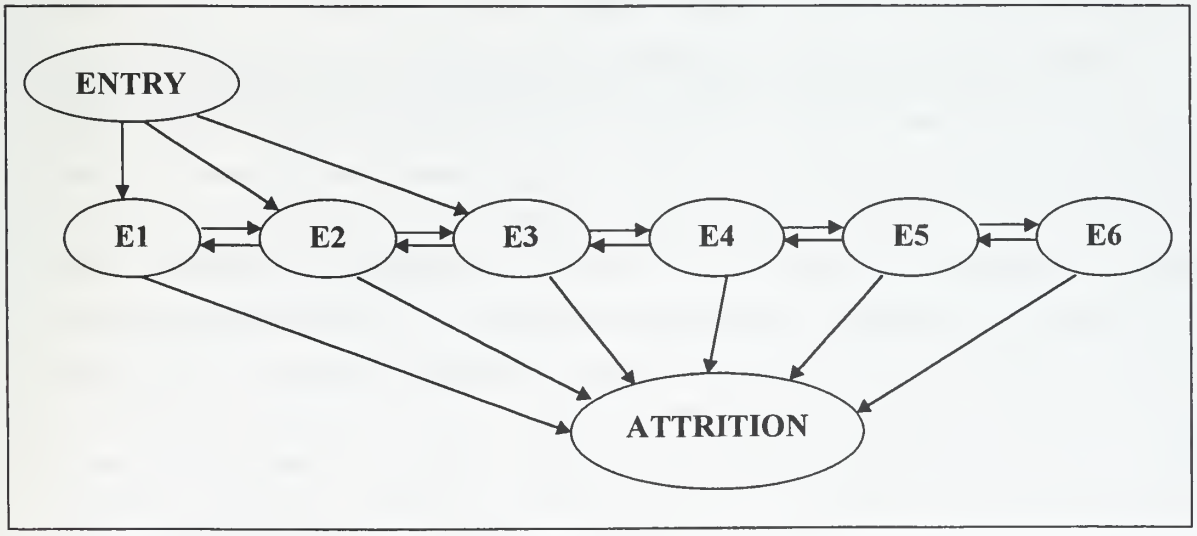


Figure 3.1 Possible Career Progression

Throughout this study, the Army, Navy, Air Force and Marine Corps were kept separate. Each service's ceremonial unit personnel were compared only to the random sample from that service. Further, there was concern that other explanatory variables may be contributing to the advancement or attrition processes. Attempts were made to adjust for such effects using variables that were readily available in the files. In particular, exploratory work with logistic regressions was made in an effort to predict the effects of entry level variables and the number of months spent in a specific paygrade on the binary variable for attrition from that paygrade. Logistic regression fits a binary response variable to a function of predictor variables so that the predicted probabilities approach but never meet or exceed the boundaries of zero and one (Hamilton, 1992). Predictor variables included were the time spent in the paygrade before either being advanced or leaving the service, gender, race, AFQT group, age at entry, census region, height and weight. The response variables were the binary variables for attrition from paygrades E3, E4 and E5. These models, when fitted, were uninformative. The response variable was then changed to the categorical variable for time spent in a paygrade and the binary variable for attrition was used as an explanatory variable. For this structure, some generalized linear models using the gamma, Poisson, and Gaussian families were attempted. The explanatory variables did not account for very much of the variability in either advancement or attrition. It was decided not to continue in this manner; the available variables did not account for much of the variability.

B. DISTRIBUTION OF TIME TO ADVANCE

Quantile-quantile plots (QQ plots) were used and fitted with a straight line by the method of least squares in order to determine if the distribution of time spent in each paygrade before either leaving the service or being advanced was the same for each service's guard and random sample groups. Under the assumption that straight line models were viable, it was assumed that the residuals were normally distributed and that standard statistical procedures regarding the parameters of the lines were usable. The groups were divided into those who were advanced, those who were censored and those that left the service at the lower paygrade. The three groups were then sorted by time spent in the paygrade before one of the above events occurred. For example, the Army's Old Guard contained 3010 people who attained the paygrade E3. Of these, 2374 were advanced to paygrade E4, 313 were censored (still on active duty as an E3 as of

December 1996) and 301 left the Army as an E3 having never been advanced to paygrade E4.

For each service and paygrade combination, the number of months spent in each paygrade for the guard and random sample groups were plotted in quantile-quantile plots to determine if the two groups had the same distribution on the number of months. Then, an ordinary least squares line was calculated and overlaid on the quantile-quantile plot as shown in Figure 3.2. The closer the least squares line is to a line with slope equal to one and y intercept of zero, the stronger the indication that the two distributions are similar in shape, spread and center (Hamilton, 1992).

Representing the least squares line as $\hat{Y}(x) = \hat{a} + \hat{b}x$, the $(1-\alpha)\%$ confidence interval for the true slope is calculated as

$$\hat{b} \pm t_{1-\alpha/2,n-2}\left(\frac{s}{\sqrt{s_{xx}}}\right)$$

Similarly, the confidence interval for the y intercept is calculated as

$$\bar{y} - \hat{b}\bar{x} \pm t_{1-\alpha/2,n-2}\, s\sqrt{\frac{1}{n} + \frac{\bar{x}^2}{s_{xx}}}$$

where $\hat{a}$ and $\hat{b}$ are the least squares estimators of the y intercept and slope respectively, s is the residual standard error, s_{xx} is the sum of squared deviations, $\bar{x}$ and $\bar{y}$ are the mean values for the random sample and the ceremonial groups respectively, n is the number of observations, and $t_{1-\alpha/2,n-1}$ is the $100*(1-\alpha/2)th$ percentile of the Student t distribution with n-2 degrees of freedom (Hamilton,1992). Confidence intervals for $\alpha = 0.05$ were calculated for each case to determine if the least squares estimators for the slope and y intercept were significantly different from one and zero, respectively.

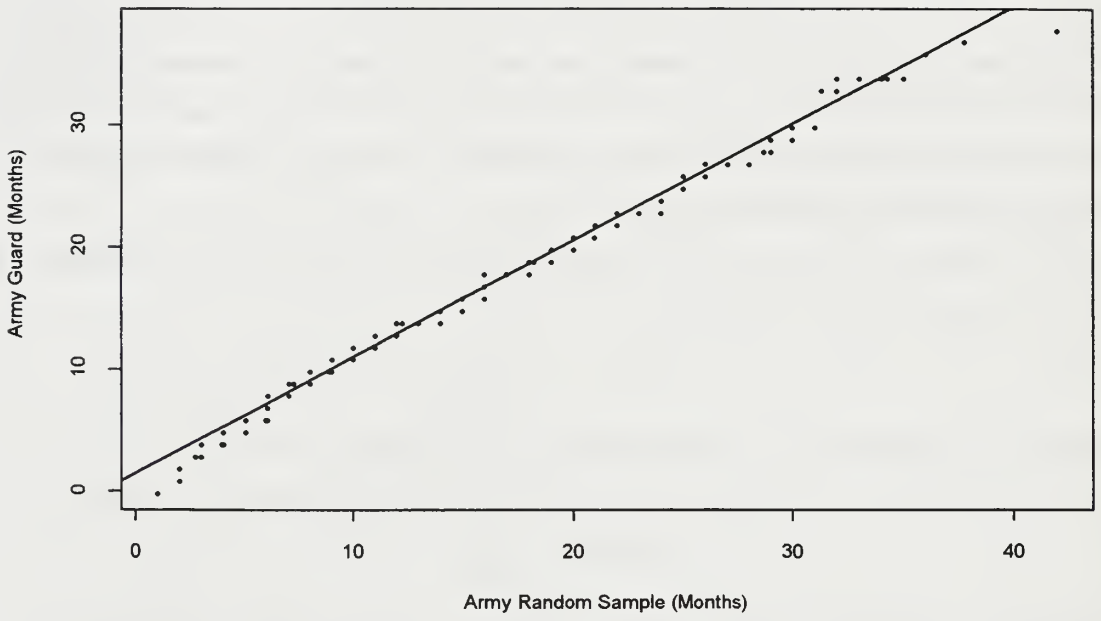


Figure 3.2 QQ Plot of Army Time to Advance from Paygrade E3 to E4

IV. ANALYSIS

A. GENERAL INFORMATION

For each service, Army, Navy, Air Force and Marine Corps, the percentage of eligible members being advanced and the number of months required to attain that advancement were analyzed. Additional investigation included the attrition rates from each paygrade. For the purpose of this study, attrition refers to a service member leaving the service from a specific paygrade for any reason, voluntary or involuntary. Due to service specific policies on advancement, members of each ceremonial unit were only compared to members of their own service. Further, throughout the analysis, an "eligible" service member is one who has achieved the lower paygrade of the paygrade interval, but who may or may not actually be eligible for advancement to the next paygrade based on time in service or time in grade requirements.

In an effort to extract as much information as possible, records that had correct data for one or more advancements but were missing data for a subsequent advancement were included in the earlier calculations and deleted when the missing information interfered with the analysis. Therefore, distributed numbers shown may not produce verifiable totals and percentages may add to a figure less than 1.00.

B. ARMY RESULTS

1. Career Flow of Army Service Members

The flow of Army service members is depicted in Figure 4.1. Starting on the left hand side with the box labeled "Entry", a service member enters the Army and has one of three things occur. The member can be advanced to paygrade E3 (Private First Class), can undergo attrition (leaving the Army without ever advancing to paygrade E3), or can be censored (remaining in the Army awaiting advancement to paygrade E3). The numbers and percentages on the arrows leaving the "Entry" box indicate the career progress of the members who joined the Army.

For the subsequent box labeled "E3", the numbers inside the box represent the number of service members who were advanced to paygrade E3 during the period covered by this study. The percentage listed represents the percentage of all service members in

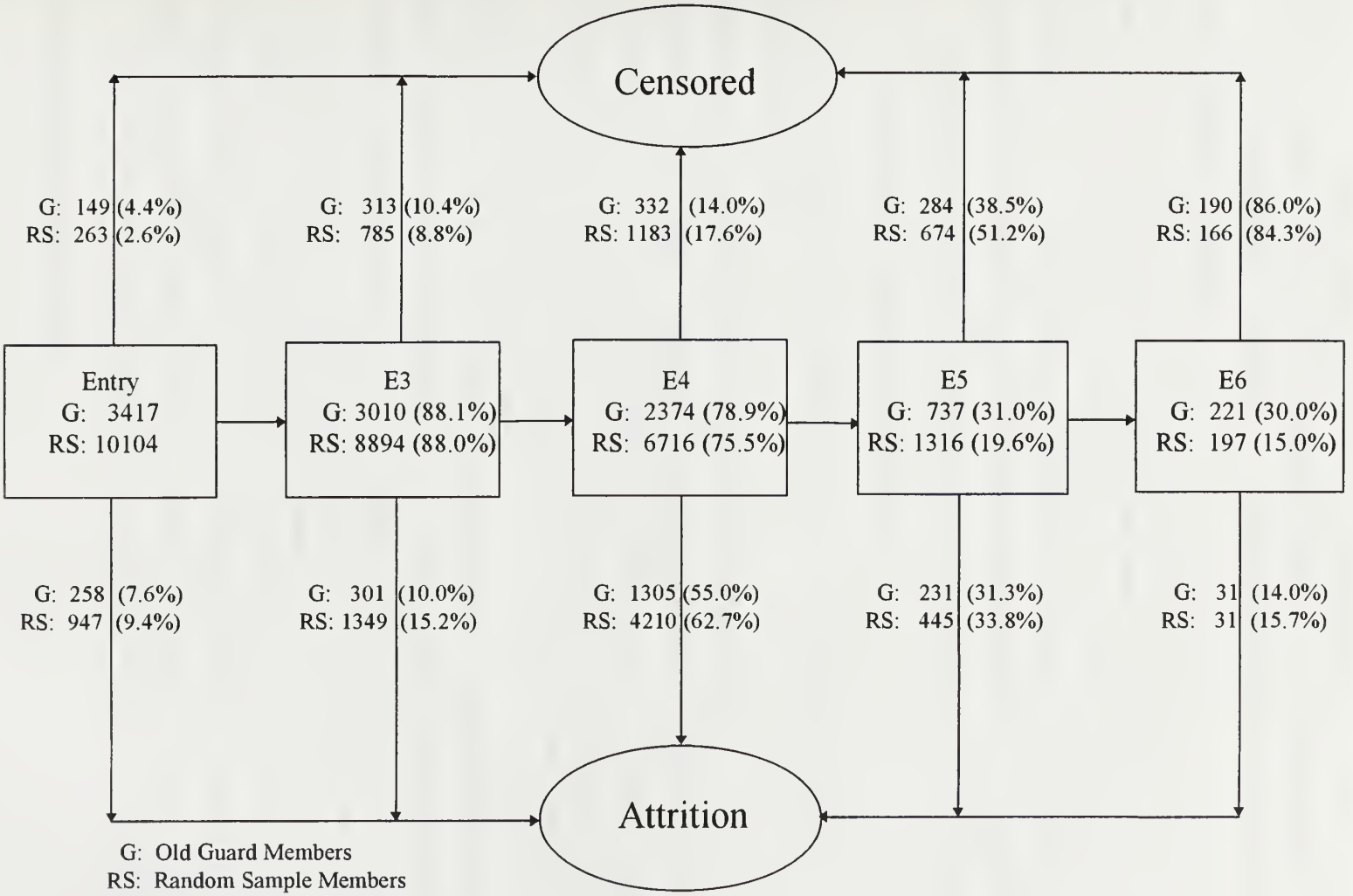


Figure 4.1 Career Flow of Army Service Members

the study group the were advanced to paygrade E3. The three arrows leaving this box indicate the events occurring to this set of people. Thus, the percentages for advancement, attrition, and censoring are conditioned upon the service member attaining the paygrade E3. The same pattern holds for the boxes labeled "E4", "E5" and "E6." For example, regarding the box labeled "E4", 2374 (78.9%) of the 3010 Old Guard members who had been advanced to paygrade E3 were advanced to paygrade E4. Of these 2374 members who attained the paygrade E4, 737 (31.0%) were advanced to paygrade E5, 332 (14.0%) were, as of December 1996, still in the Army awaiting advancement to E5 and 1305 (55.0%) left the service as an E4 never having been advanced to paygrade E5. The only exception to this pattern were the few members who were advanced to paygrade E7. Since no calculations were conducted for paygrade E7, the members who were advanced to this paygrade were included in the group of censored E6s. As these members had not left the Army in paygrade E6, they could not be counted within the attrition category.

2. Advancement and Attrition Percentages

For cohort years 1986 to 1995, the Army's ceremonial unit, The Old Guard, had 3417 records available for analysis. The corresponding random sample contained 10,104 records. As shown in Figure 4.1, a nearly equal percentage of each group, 3010 (88.1%) of the Old Guard members and 8894 (88.0%) of the random sample members were advanced to paygrade E3, Private First Class. Additionally, both groups had relatively similar percentages leave the service before ever achieving paygrade E3; 258 members (7.6%) of the Old Guard members compared to 947 (9.4%) of the random sample. Due to the screening process for selection to the Old Guard, it was expected that the attrition rate for the Guard would be lower.

Of the 3010 eligible Old Guard members, 2374 (78.9%) were advanced to paygrade E4, Specialist Fourth Class, whereas 6716 (75.5%) of the 8894 eligible random sample members were advanced. Further, the Old Guard members were less likely to leave the service as an E3 without ever having advanced to paygrade E4. The Old Guard experienced 301 members (10.0%) leaving compared to 1349 members (15.2%) of the random sample leaving the service as an E3.

Of the 2374 Old Guard members eligible, 737 (31.0%) were advanced from paygrade E4, Specialist Fourth Class, to paygrade E5, Sergeant, compared to 1316 (19.6%) of the 6716 eligible random sample members. The Old Guard and the random

sample both experienced high levels of attrition from paygrade E4 with 1305 (55.0%) and 4210 (62.7%), respectively, leaving the Army before advancing to paygrade E5. The high attrition levels from paygrade E4 may be attributed to the voluntary separation of service members encountering the end of their first enlistment contract.

Of the 737 Old Guard members eligible, 221 (30.0%) were advanced from paygrade E5, Sergeant, to paygrade E6, Staff Sergeant, compared to 197 (15.0%) of the 1316 eligible random sample members. The Old Guard and the random sample experienced approximately the same attrition from paygrade E5 with 231 (31.1%) and 445 (33.8%), respectively, leaving the Army before advancing to paygrade E6.

3. Distribution of Time Required to Advance

The quantile-quantile plot (QQ plot) shown in Figure 4.2 compares the number of months required to advance from paygrade E3 to paygrade E4 for the Old Guard compared to the quantiles of the random sample population. The least squares line has a slope of 0.96 and a y intercept of 1.48, both of which are statistically different, at the 95% confidence level, from the desired slope of one and y intercept of zero. This indicates that the two populations do not have the same distribution. However, since the points follow the line very closely, there are indications that the distributions of the number of months required to be advanced are similar in shape but have a different center and spread (Hamilton, 1992). The y intercept of 1.48 lends an indication that the old Guard members required, on average, an additional 1.48 months before being advanced from paygrade E3 to E4.

The QQ plots for advancement from paygrade E4 to paygrade E5 and from paygrade E5 to paygrade E6 are located in Appendix A. Table 4.1 summarizes the least squares estimates for the slopes and y intercepts and indicates whether the points closely follow a linear pattern. Numbers in bold indicate values that are significantly different from one for a slope estimate and zero for a y intercept estimate.

For advancement from paygrade E4 to E5, the estimator for the slope was 1.04 and the estimator for the y intercept was 0.07. At the 95% confidence level, the slope is statistically different from one; however, the y intercept is not different from zero. Further, the points follow very closely to a straight line. Thus, the distributions of time required to advance are similar in shape and have the same center; however, they have different spreads (Hamilton, 1992).

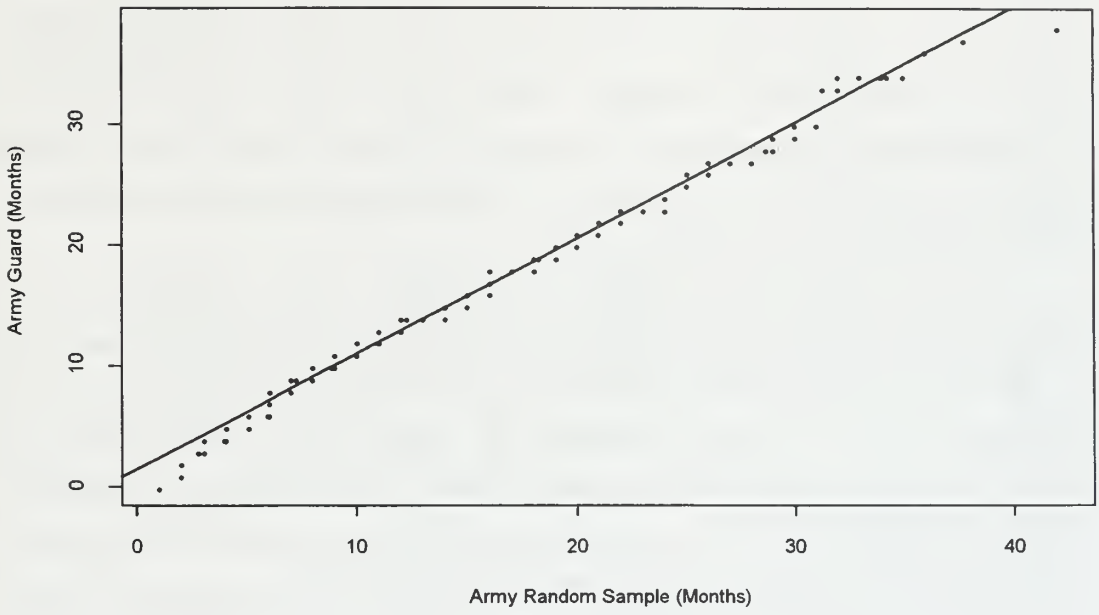


Figure 4.2 QQ Plot of Army Time to Advance from Paygrade E3 to E4

		Army	
		Advancement	Attrition
E3 to E4	Slope	**0.96**	**0.93**
	Intercept	**1.48**	0.07
	Linear	Yes	Yes
E4 to E5	Slope	**1.04**	**0.91**
	Intercept	0.07	**2.19**
	Linear	Yes	Yes
E5 to E6	Slope	0.99	**0.92**
	Intercept	**-2.16**	**-1.76**
	Linear	Yes	Yes

Table 4.1 Least Squares Estimates

For advancement from E5 to E6, the least squares line has a slope of 0.99 and a y intercept of -2.16. At the 95% confidence level, the slope is not statistically different from one; however, the y intercept is different from zero. The points follow the line closely except in the range of 50 to 60 months where there are indications that the Old Guard members being advanced at that point were able to do so in a shorter period of time than their random sample counterparts. Further, the y intercept of -2.16 indicates that the Old Guard members require, on the average, 2.16 months less than their counterparts to advance from paygrade E5 to E6. Overall, the distributions are similar in shape and spread but have different centers (Hamilton,1992).

The second column in Table 4.1 corresponds to the time spent in a paygrade before leaving the service at that paygrade. For all three paygrades analyzed, the points on the QQ plots (Appendix A) essentially follow a linear pattern; however, at the 95% confidence level, the slopes are statistically different from one indicating that the distributions have similar shape but different spread. For attrition from paygrade E3, the y intercept estimate of 0.07 is not significantly different from zero indicating that the two distributions have the same center. However, for attrition from paygrades E4 and E5, the y intercept estimates are significantly different from zero indicating that these two sets of distributions have different centers. Since the estimated slopes are all less than one, the indication is that an Old Guard member who leaves the service before being advanced to the next paygrade does not spend as much time in that paygrade before leaving as the general random sample population.

C. NAVY RESULTS

1. Advancement and Attrition Percentages

The Navy's Ceremonial Guard had 1029 records available for analysis and the comparative random sample contained 3972 records. As shown in Figure 4.3, of these eligible service members, 887 (86.2%) of the Guard members and 2901 (73.1%) of the random sample members were advanced to paygrade E3. The Ceremonial Guard had 86 (8.4%) members leave the service prior to advancing to E3 whereas the random sample had 714 (18.0%) leave the service having never advanced to E3. Both of these

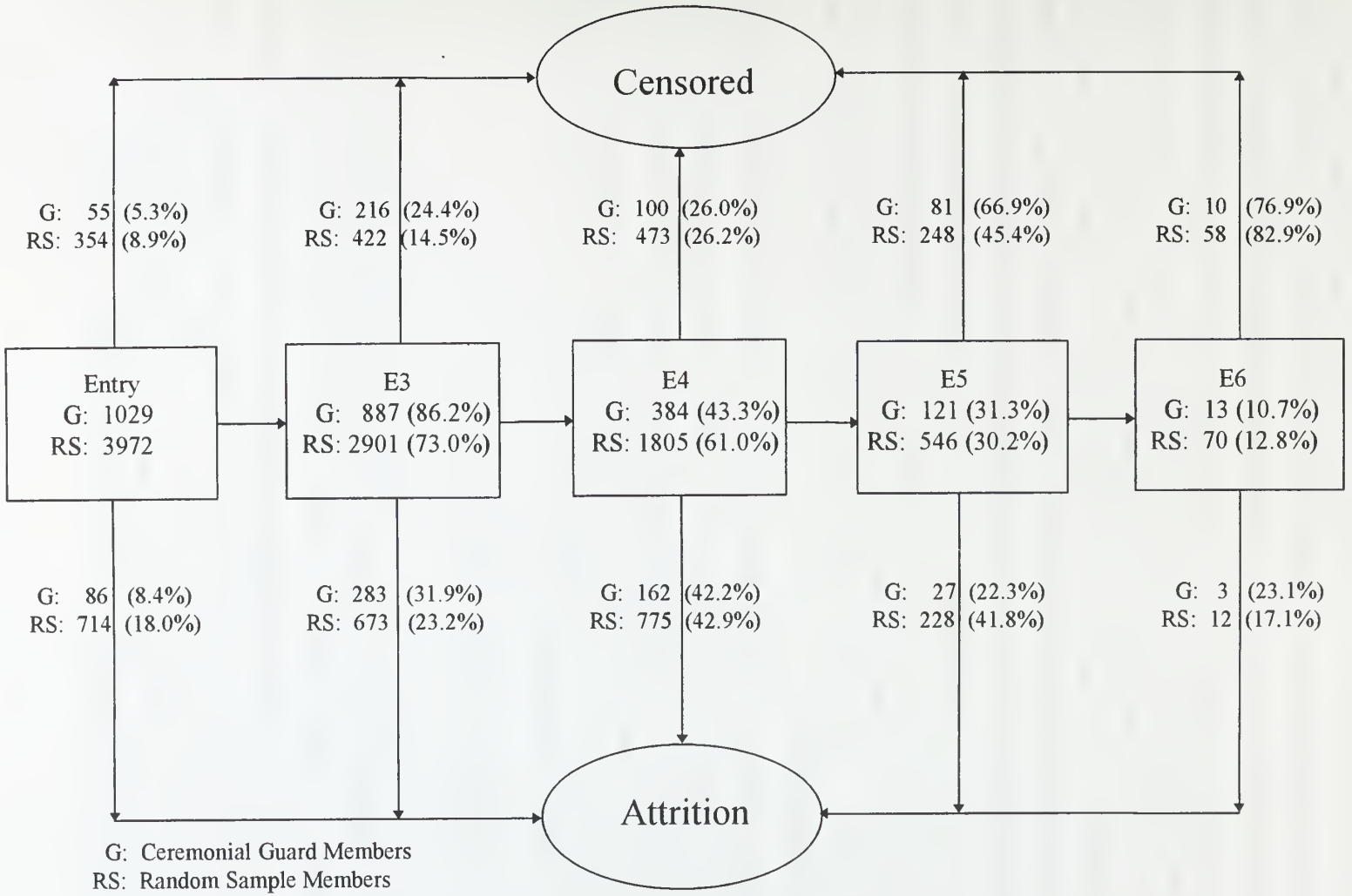


Figure 4.3. Career Flow of Navy Service Members

percentages seem quite high for entry level separations, especially the ceremonial unit percentage, given the strict screening process prior to selection to the Guard.

The Ceremonial Guard had a lower percentage of its members advanced to paygrade E4, Petty Officer Third Class, with only 384 (43.3%) of the 887 eligible members being advanced. In contrast, the random sample had 1805 (61.0%) of its members advance to paygrade E4. The Ceremonial Guard also experienced higher attrition from paygrade E3, losing 283 (31.9%) members compared to 673 (23.2%) of the random sample. However, the Ceremonial Guard members were very similar to the random sample for the subsequent advancements. Of the 384 eligible Guard members, 121 (31.3%) were advanced to paygrade E5, Petty Officer Second Class, versus 546 (30.2%) of the 1805 eligible random sample members. Both groups experienced high, but nearly equal, attrition from paygrade E4. Again, high attrition from this paygrade may be attributed to the end of the first enlistment contract. The Ceremonial Guard experienced the loss of 162 (42.2%) members whereas the random sample experienced the loss of 775 (42.9%) members. These service members left the Navy at paygrade E4 having never advanced to paygrade E5.

From paygrade E5, the two groups were again similar in advancement statistics with the Guard having 13 (10.7%) of its 121 eligible members and the random sample having 70 (12.8%) of its 546 eligible members advance from paygrade E5 to paygrade E6, Petty Officer First Class. However, the Guard unit had significantly lower attrition from paygrade E5, losing only 27 (22.3%) compared to 228 (41.8%) of the random sample members as Petty Officer Second Class (E5).

2. Distribution of Time Required to Advance

The QQ plot shown in Figure 4.4 compares the number of months required to advance from paygrade E3 to paygrade E4 for the Ceremonial Guard members compared to the quantiles of the random sample members. The least squares line has a slope of 1.33 and a y intercept of 3.26, significantly different from one and zero respectively. Since the distribution of points does essentially follow a linear pattern, the two distributions have the same shape; however, the spreads and centers are different (Hamilton,1992). The indication is that the Ceremonial Guard members require a significantly longer time to advance to paygrade E4 than their random sample counterparts.

The QQ plots for advancements from Petty Officer, Third Class (E4) to Petty Officer, Second Class (E5) and from Petty Officer, Second Class to Petty Officer, First Class (E6) are located in Appendix B. Table 4.2 summarizes the least squares estimates for the slope and y intercepts with numbers in bold being statistically different from one and zero, respectively. Both of these higher advancements follow a linear pattern closely and have slope and y intercept estimates that are, at the 95% confidence level, indistinguishable from to one and zero respectively. Thus, the indication is that the distribution of the time to advance from paygrade E4 to paygrade E5 and from paygrade E5 to paygrade E6 is the same for both the Guard members and the random sample. However, due to the small sample size (13), the conclusion regarding advancement from Petty Officer, Second Class (E5) to Petty Officer, First Class (E6) is not powerful.

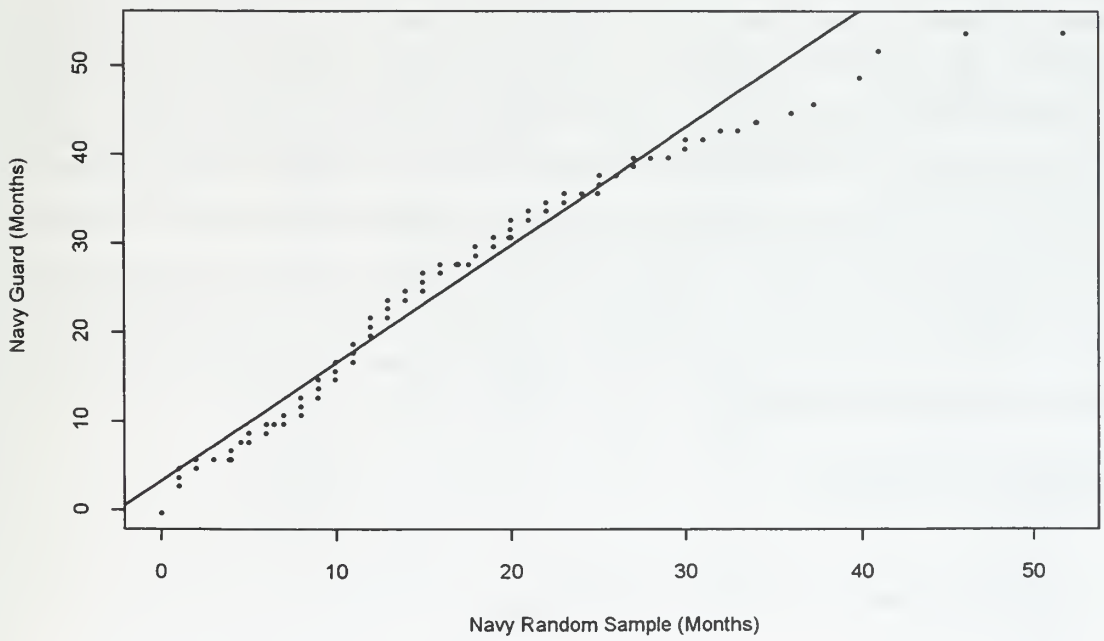


Figure 4.4 Navy Time to Advance from Paygrade E3 toE4

		Navy	
		Advancement	Attrition
E3 to E4	Slope	**1.33**	**1.06**
	Intercept	**3.26**	-0.06
	Linear	No	Yes
E4 to E5	Slope	0.98	**0.76**
	Intercept	0.51	**1.19**
	Linear	Yes	Yes
E5 to E6	Slope	1.14	**0.91**
	Intercept	-6.28	**1.89**
	Linear	Yes	Yes

Table 4.2 Least Squares Estimates

The second column in Table 4.2 addresses the distribution of time spent in a paygrade prior to leaving the Navy at that paygrade never having been advanced. For paygrades E3, E4, and E5, the QQ plots (Appendix B) follow essentially a linear pattern with slight deviations in the higher (>35) months. However, the slopes are statistically different from one at the 95% confidence level. The indication is that the Ceremonial Guard members who leave the Navy as Petty Officer, Third (E4) or Second (E5) Class spend less time in the last paygrade before leaving than do the random sample members. The reverse is true for Seamen, Airmen and Firemen (paygrade E3) where the slope of 1.06 indicates that these members remain in the Navy slightly longer than their random sample counterparts. For all three paygrades, the distributions of time spent in the last paygrade for the Ceremonial Guard and the random sample have similar shapes but different spreads and centers (Hamilton, 1992).

D. AIR FORCE RESULTS

1. Advancement and Attrition Percentages

As shown in Figure 4.5, the Air Force Honor Guard had 537 records available from cohort years 1986 to 1995. The random sample was composed of 3997 records. Of these eligible members, 521 (97.0%) of the Honor Guard and 3703 (92.6%) of the random sample were advanced to paygrade E3, Airman First Class. Both groups had very

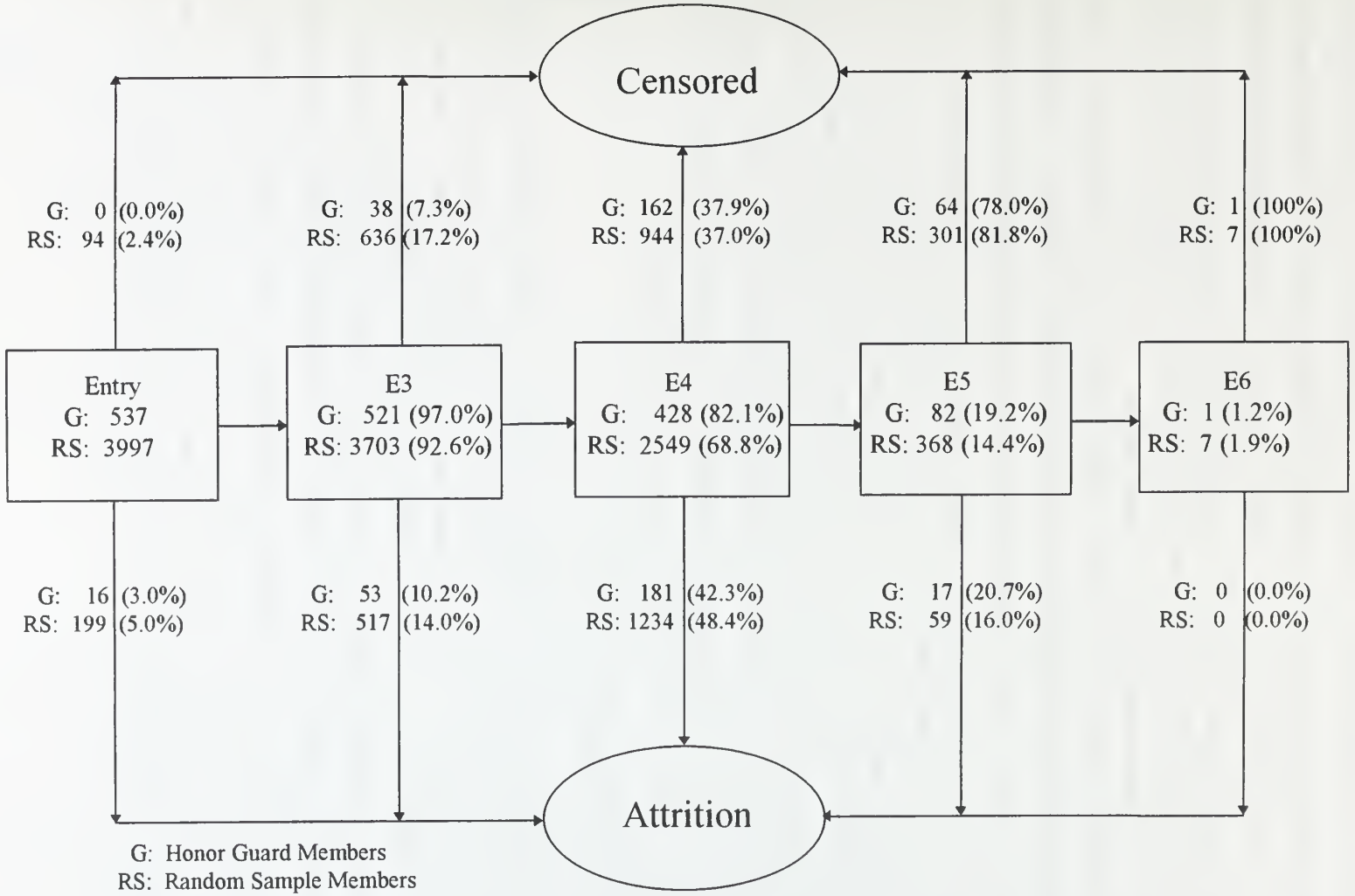


Figure 4.5 Career Flow of Air Force Service Members

low attrition prior to attaining paygrade E3. The Honor Guard lost 16 (3.0%) of its members compared to 199 (5.0%) of the random sample.

The Honor Guard members were also very successful in advancing to paygrade E4, Senior Airman, with 428 (82.1%) of the 521 eligible members being advanced as compared to 2549 (68.8%) of the 3703 eligible random sample members. Both groups experienced similar attrition rates with the Honor Guard losing 53 (10.2%) and the random sample losing 517 (14.0%) of their respective members as Airman First Class (E3) who had never been advanced to Senior Airman (E4).

For advancement from Senior Airman (E4) to Staff Sergeant (E5), and from Staff Sergeant (E5) to Technical Sergeant (E6), both groups were very similar. The Honor Guard had 82 (19.2%) of its 428 eligible members advance to paygrade E5 and 1 (1.2%) of the eligible 82 members advance to Technical Sergeant (E6). The random sample had 368 (14.4%) of the eligible 2549 members advance to Staff Sergeant (E5) and 7 (1.9%) of the 368 eligible members advance to Technical Sergeant (E6). Again, possibly due to end of enlistment contracts, both groups had relatively high attrition from paygrade E4. The Honor Guard experienced 42.3% and the random sample experienced 48.4% attrition for members leaving the Air Force as an E4 having never been advanced to E5. The two groups also had similar attrition rates from paygrade E5; the Honor Guard lost 17 (20.7%) and the random sample lost 59 (16.0%) members as Staff Sergeant (E5).

2. Distribution of Time Required to Advance

The QQ plot in figure 4.6 compares the number of months required to advance from paygrade E3 to paygrade E4 for the Honor Guard compared to the quantiles of the random sample population. The least squares line has a slope of 1.04 and a y-intercept of -0.06, both of which are not statistically different, at the 95% confidence level, from the desired slope of one and y intercept of zero. However, since the points do not follow a linear pattern, the indication is that the distributions of the number of months required to be advanced are different in shape but may have the same center and spread (Hamilton, 1992). The shape of Figure 4.6 is caused by the Air Force policy, stated in Air Force Pamphlet 36-2241, to advance all eligible individuals to paygrade E4 after 36 months time is service (TIS) and 20 months time in grade (TIG) or 28 months TIG, whichever occurs first.

Table 4.3 summarizes the slope and y intercept estimates for least squares lines fit to the QQ plots (Appendix C) for advancement from paygrade E4 to paygrade E5 and for attrition from paygrades E5 and E6. No calculations were performed on advancement from paygrade E5 to E6 due to the fact that only one Honor Guard member in this study attained the higher paygrade.

The QQ plot for advancement from E4 to E5 follows a linear pattern and has a slope estimate of 1.02 that is not statistically different from one. Therefore, the indication is that the two distributions have similar shape and spread. However, the y intercept estimator of -2.76 indicates that, on the average, the Honor Guard members were able to advance from Senior Airman (E4) to Staff Sergeant (E5) 2.76 months faster than their counterparts in the random sample.

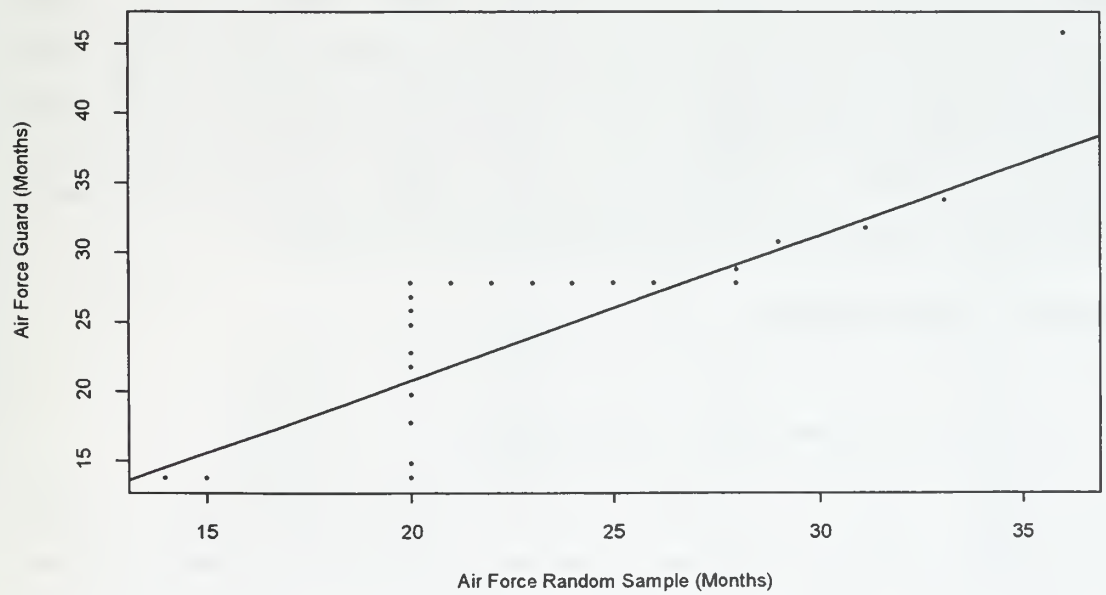


Figure 4.6 QQ Plot of Air Force Time to Advance from Paygrade E3 to E4

		Air Force	
		Advancement	Attrition
E3 to E4	Slope	1.04	**1.08**
	Intercept	-0.06	**-0.62**
	Linear	No	Yes
E4 to E5	Slope	1.02	1.00
	Intercept	**-2.76**	**5.61**
	Linear	Yes	No
E5 to E6	Slope	NA	**0.96**
	Intercept	NA	**3.94**
	Linear	NA	Yes

Table 4.3 Least Square Estimates

The QQ plots for attrition from paygrade E3 and E5 follow linear patterns. The estimated slopes for attrition from paygrade E3 (1.08) and from paygrade E5 (0.96) are statistically different from one indicating that the Honor Guard members serve more time in the lower paygrade (E3) before leaving the Air Force without being advanced while spending less time in the higher paygrade (E5) before leaving the service. The estimated slope for attrition from paygrade E4 is equal to 1.00; however, the QQ plot is not linear. Therefore, the indication is that the two groups have different distributions of time in paygrade E4 prior to leaving the service without advancing to paygrade E5.

E. MARINE CORPS RESULTS

1. Advancement and Attrition Percentages

For cohort years 1986 to 1995, the Marine Barracks, Washington had 3741 records available for analysis and the random sample contained 9951 records. As shown in Figure 4.7, of these eligible service members, the Marine Barracks had 3566 (95.3%) compared to 9015 (90.6%) of the random sample achieve paygrade E3, Lance Corporal. The Marine Barracks, Washington had an attrition rate of 2.3% (84 of 3741) for members less than Lance Corporal while the random sample had attrition of 7.2% (715 of 9951). The low attrition rate for the Marine Barracks, Washington again coincides with the strict screening process for selection to the ceremonial unit.

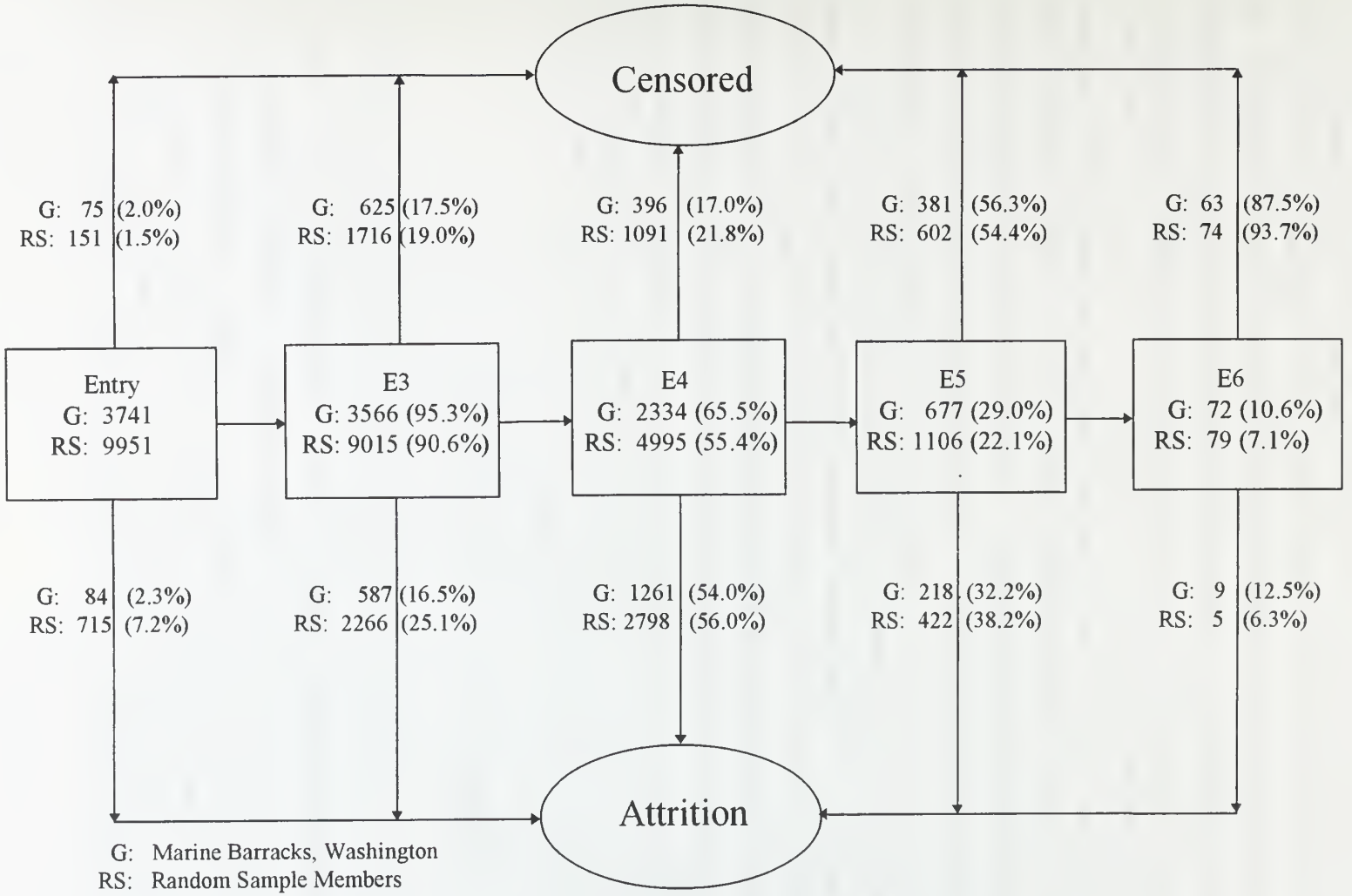


Figure 4.7 Career Flow for Marine Corps Service Members

The members of the Marine Barracks, Washington were very successful in attaining paygrade E4, Corporal, with 2334 (65.5%) of the 3566 eligible members versus only 4995 (55.4%) of the 9015 eligible random sample being advanced to Corporal. Further, the Marine Barracks, Washington experienced lower attrition rates for its members at paygrade E3. The ceremonial unit lost 587 (16.5%) members to the random sample's loss of 2266 (25.1%) members who had attained paygrade E3, Lance Corporal, but never advanced to E4, Corporal.

The Marine Barracks, Washington also had higher percentages of its members advance from Corporal (E4) to Sergeant (E5) as well as from Sergeant (E5) to Staff Sergeant (E6) than did the random sample. The Marine Barracks, Washington had 677 (29.0%) of the 2334 eligible members advance to Sergeant (E5) and 72 (10.6%) of the 677 eligible members advance from Sergeant (E5) to Staff Sergeant (E6). In contrast, the random sample had 1106 (22.1%) of the 4995 eligible members advance to Sergeant and 79 (7.1%) of the 1106 eligible members advance to Staff Sergeant. Similar to the other services and most likely caused by the end of the first enlistment contract, both the Marine Barracks, Washington and the random sample experienced relatively high attrition rates from paygrade E4. The Marine Barracks lost 54.0% and the random sample lost 56.0% of their members as Corporals (E4) who had never advanced to Sergeant (E5). Additionally, the attrition rates from Sergeant were similar for the two groups with the Marine Barracks, Washington losing 218 (32.2%) of 677 members and the random sample losing 422 (38.2%) of the 1106 eligible members.

2. Distribution of Time Required to Advance

The QQ plot in figure 4.8 compares the number of months required to advance for paygrade E3 to paygrade E4 for the Marine Barracks, Washington compared to the quantiles of the random sample population. The least squares line has a slope of 0.89 and a y intercept of 2.06, both of which are statistically different, at the 95% confidence level, from the desired slope of one and y intercept of zero. However, since the points follow a linear pattern, the indication is that the distributions of the number of months required to be advanced are similar in shape but different in center and spread (Hamilton, 1992). The indication is that the members of Marine Barracks, Washington require an overall shorter

time before attaining Lance Corporal (E3) and have fewer members requiring the longer (>45 months) times to be advanced.

Table 4.4 summarizes the slope and y intercept estimates for least squares lines fit to the QQ plots (Appendix D) for advancements from Corporal (E4) to Sergeant (E5) and from Sergeant (E5) to Staff Sergeant (E6) and for attrition from Corporal, Sergeant, and Staff Sergeant. All of the QQ plots have a linear pattern indicating that the compared distributions have similar shapes. However, the slope (1.05) and y intercept (-0.52) for advancement from paygrade E4 to paygrade E5, at the 95% confidence level, are statistically different from one and zero respectively indicating a different spread and center (Hamilton, 1992). For advancement from paygrade E5 to paygrade E6, the estimated slope is 0.98 with an estimated y intercept of 1.26 both of which are not significantly different from one and zero, at the 95 % confidence interval, indicating the same spread and center (Hamilton, 1992).

Regarding the QQ plots for attrition from paygrades E3, E4 and E5, all the plots follow a linear pattern; indicating the compared distributions have the same shape (Hamilton,1992). However, the slopes and y intercepts are all statistically different than one and zero respectively, indicating that the distributions have different spreads and centers (Hamilton, 1992). Further, the estimated slopes are all less than one indicating that the members of the Marine Barracks, Washington spend less time in a paygrade prior to leaving the Marine Corps without being advanced.

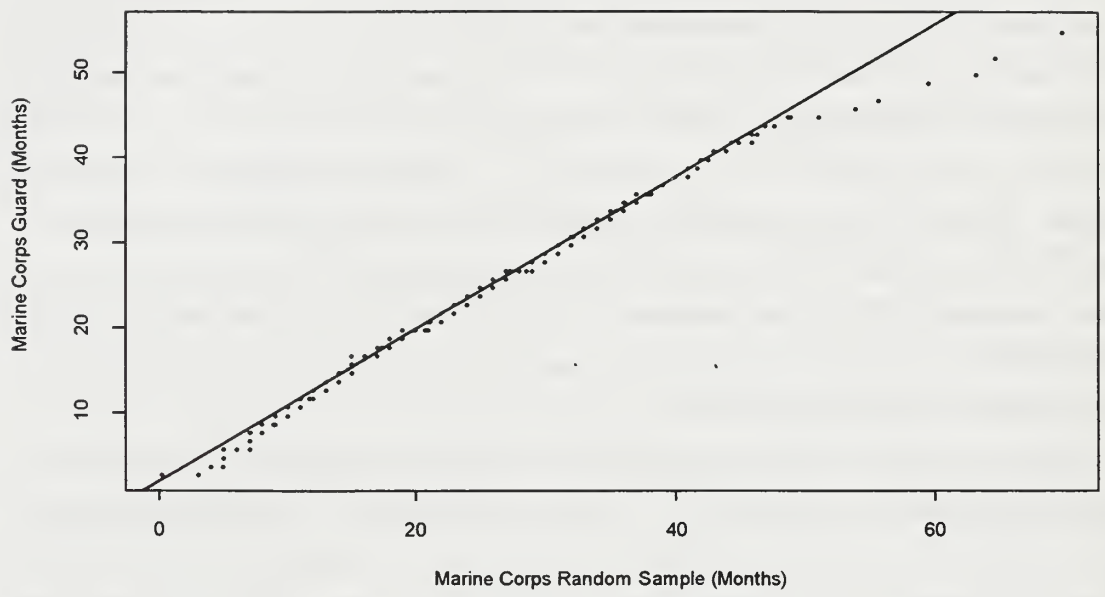


Figure 4.8 QQ Plot of Marine Corps Time to Advance from Paygrade E3 to E4

		Marine Corps	
		Advancement	Attrition
E3 to E4	Slope	**0.89**	**0.95**
	Intercept	**2.06**	**-0.61**
	Linear	Yes	Yes
E4 to E5	Slope	**1.05**	**0.96**
	Intercept	**-0.52**	**1.09**
	Linear	Yes	Yes
E5 to E6	Slope	0.98	**0.96**
	Intercept	1.26	**1.03**
	Linear	Yes	Yes

Table 4.4 Least Squares Estimates

V. RESULTS AND CONCLUSIONS

A. ARMY RESULTS

For advancements from paygrade E3 to paygrade E4 and from paygrade E4 to paygrade E5, there are, at the 95% confidence level, statistically significant differences in the shape and spread of the distribution of the time required to be advanced. However, these differences are quite small (0.96 and 1.04 compared to 1.00) and may not be noticeable on the operational level. Therefore, on the operational level, the distributions of the times are essentially the same with a slight lag (2.48 months) for the Old Guard members to be advanced to paygrade E4 that is compensated for with less time (2.16 months) required to attain paygrade E6. Of further importance is the fact that at all levels, the Old Guard members were advanced to the next paygrade in higher percentages (Figure 5.1) and left the service in smaller percentages than their peers (Figure 5.2).

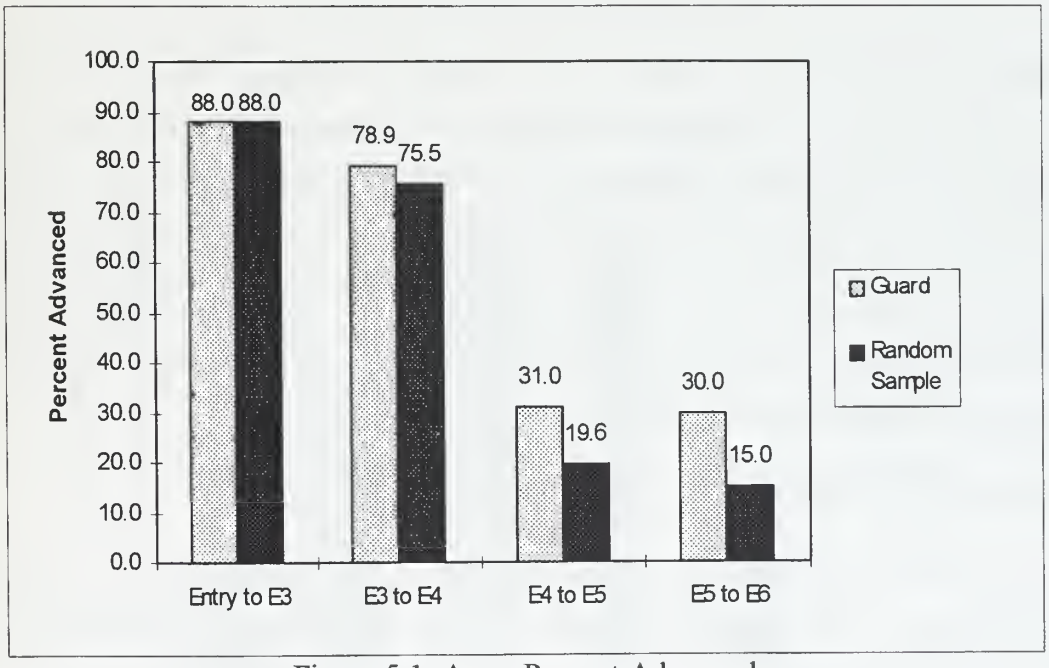


Figure 5.1 Army Percent Advanced

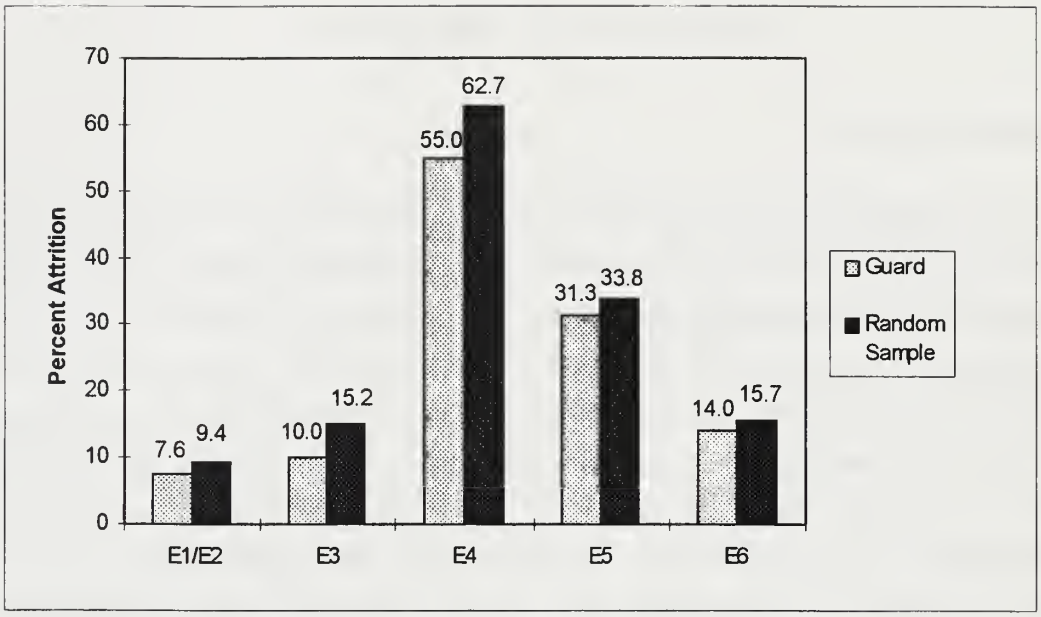


Figure 5.2 Army Percent Attrition

B. NAVY RESULTS

For advancement from paygrade E4 to E5 and from paygrade E5 to E6, the distributions of time required to advance are not significantly different. However, due to a small sample size, the result regarding advancement to paygrade E6 is not very strong. Other than for advancement to paygrade E3, the Ceremonial Guard had equal or higher percentages advanced (Figure 5.3). Attrition rates varied by paygrade with significant differences for paygrade E3 and E5 (Figure 5.4). For paygrade E3, the distribution of time required to advance was not the same for the Guard members and the random sample. The indication is that for those Guard members who did advance to paygrade E4, it took longer to attain that advancement.

C. AIR FORCE RESULTS

The Air Force Honor Guard consistently had higher percentages of its members advanced (Figure 5.5) and generally had lower attrition rates other than a slightly higher attrition rate from paygrade E5. The time required to advance from paygrade E3 to E4 is statistically the same; however, the QQ plot is not linear indicating the two distributions are different. The time required to advance from paygrade E4 to E5 is statistically the same at the 95% confidence level, with the Honor Guard members taking slightly less time than their peers to be advanced.

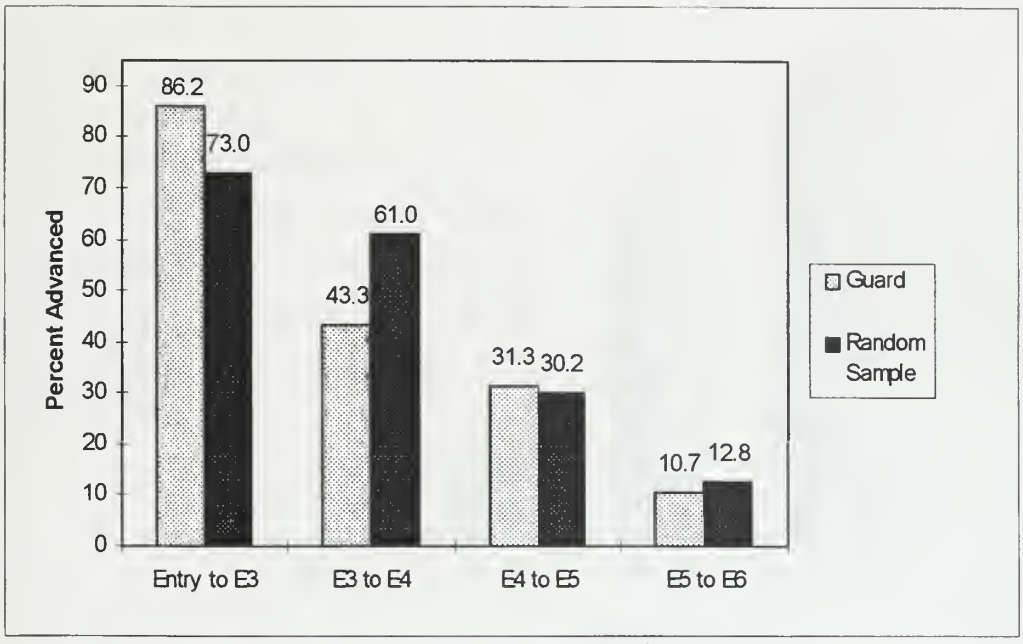


Figure 5.3 Navy Percent Advanced

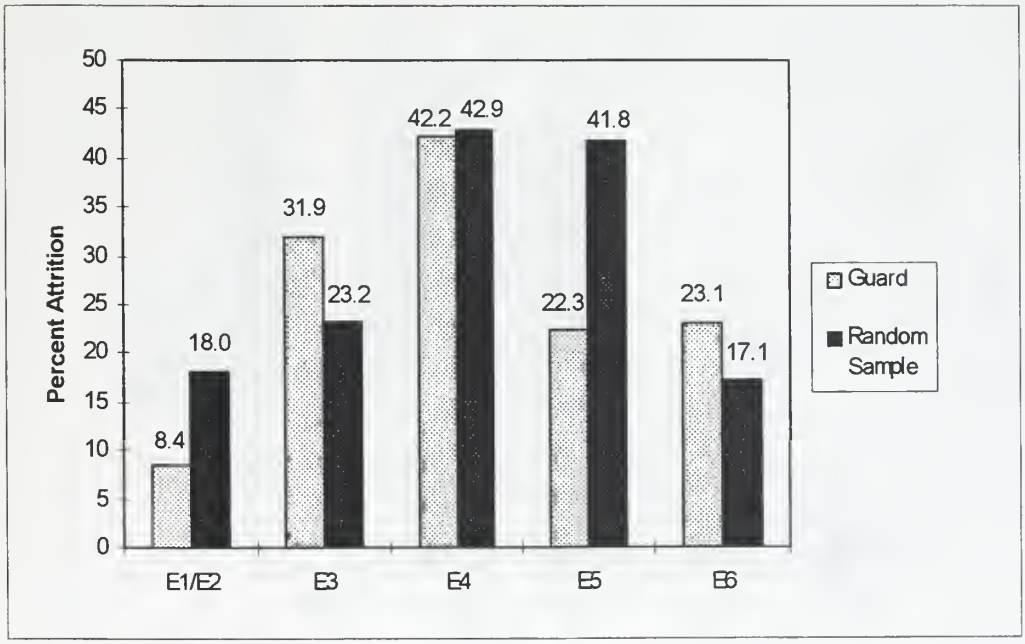


Figure 5.4 Navy Percent Attrition

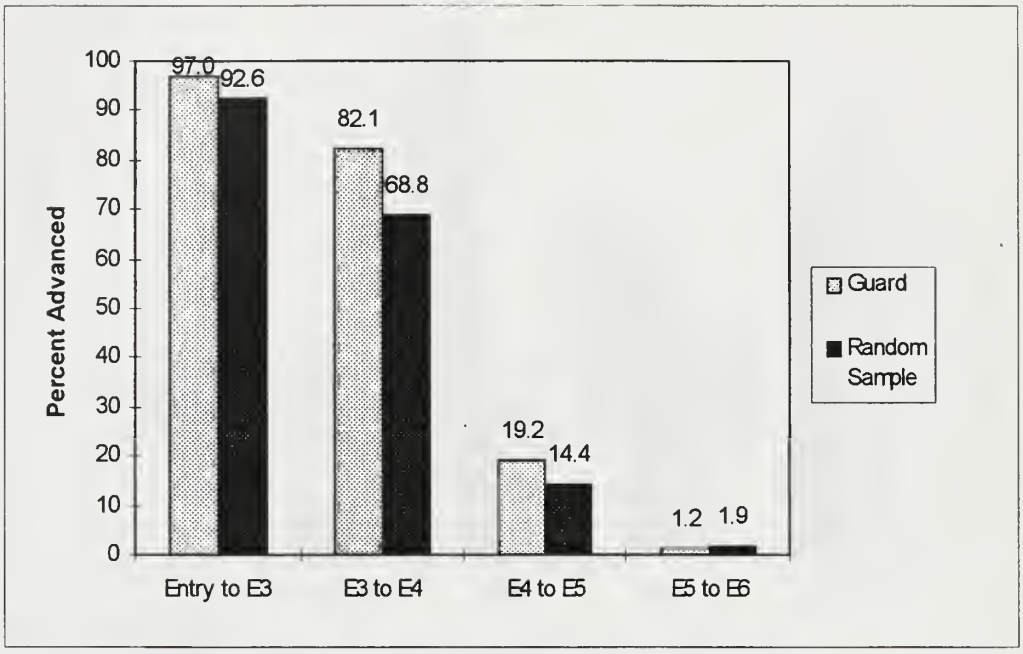


Figure 5.5 Air Force Percent Advanced

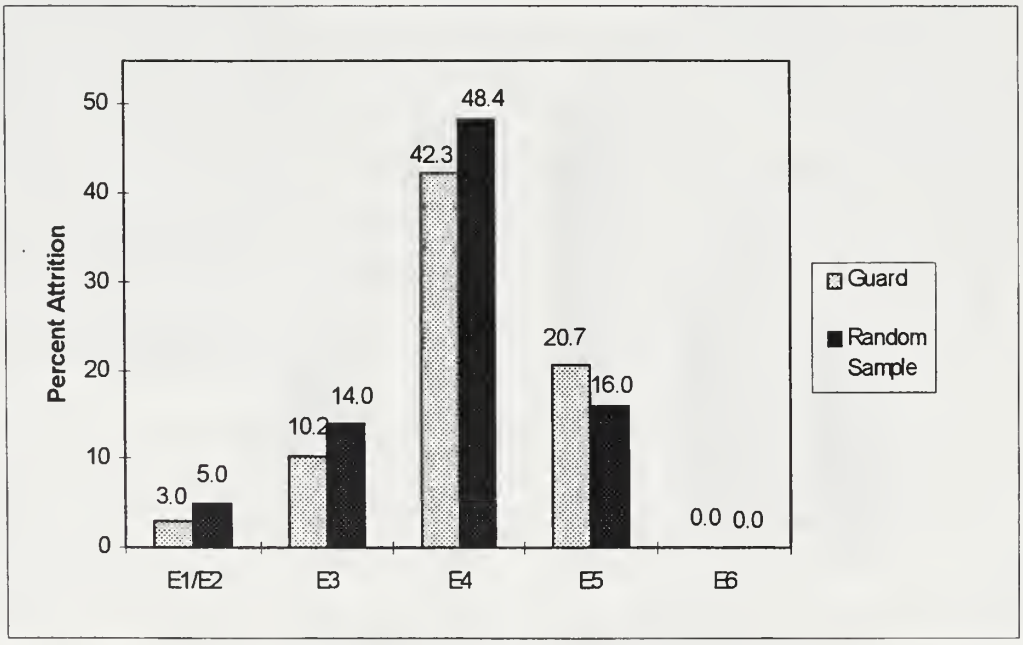


Figure 5.6 Air Force Percent Attrition

D. MARINE CORPS RESULTS

As shown in Figures 5.7 and 5.8, the Marine Barracks, Washington consistently had a higher percentage of its members advanced and had lower percentages of its members leave the Marine Corps. There were indications that the members of Marine Barracks, Washington achieved advancement to paygrade E4, Corporal, sooner than their counterparts in the random sample. The time required to advance to Sergeant (E5) may be statistically slower for the Marine Barracks; however, the variation is very small and may be hard to detect on an operational level. The distribution of time to advance to Staff Sergeant (E6) is statistically the same for both the random sample and the Marine Barracks, Washington.

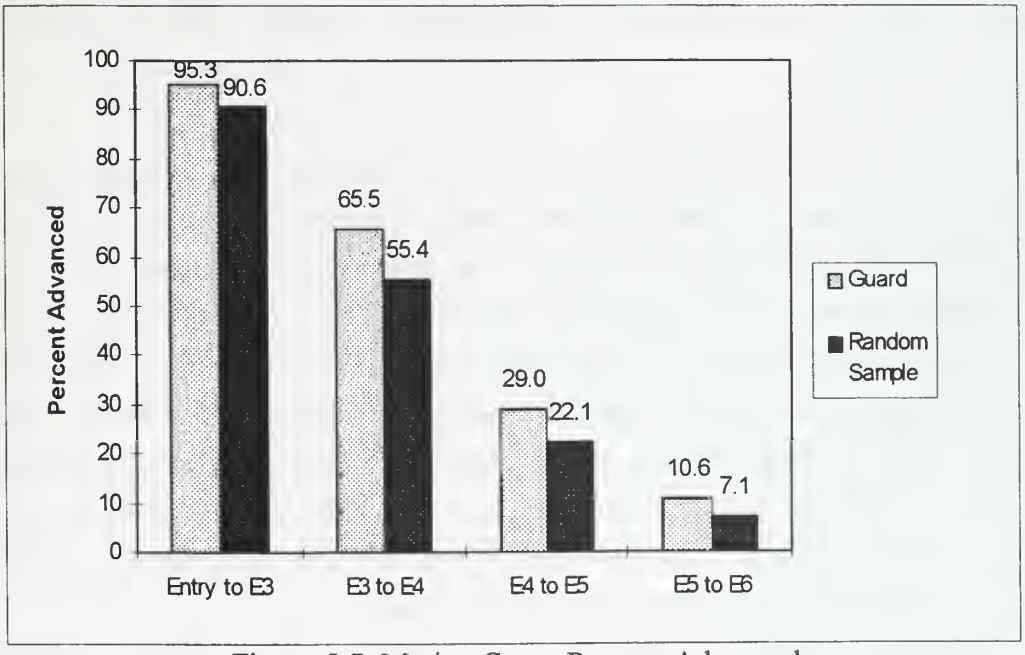


Figure 5.7 Marine Corps Percent Advanced

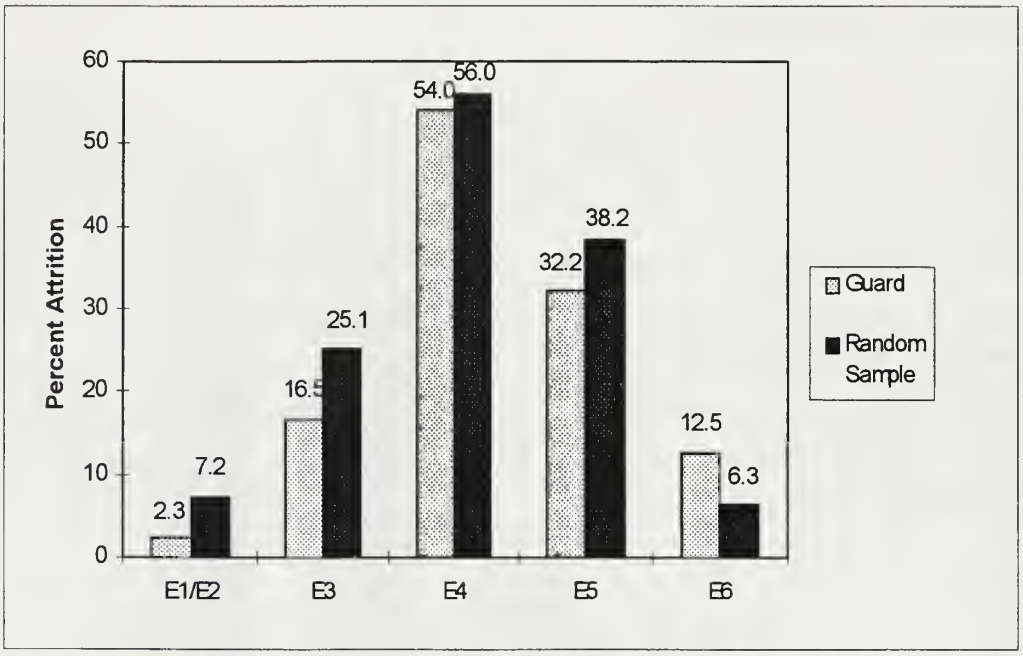


Figure 5.8 Marine Corps Percent Attrition

E. CONCLUSIONS

The purpose of this study was to determine the effects of time spent with a ceremonial unit on a service member's career. Across the four services, Army, Navy, Air Force and Marine Corps and across the three advancement windows studied, paygrade E3 to E4, paygrade E4 to E5, and paygrade E5 to E6, only one group of service members seemed to be sharply impacted by time spent with a ceremonial unit. Navy service members in paygrade E3 have a lower advancement percentage and a higher attrition percentage. Further, the distribution of time required to advance from paygrade E3 to paygrade E4 is not the same for the Navy's Ceremonial Guard members and the comparative random sample. The indication is that the Guard members who do get advanced to paygrade E4 take longer to attain that paygrade.

For all other service and paygrade combinations, the effects of time spent in the ceremonial unit may be statistically significant yet are small enough that an operational impact may be hard to detect. For all advancement processes studied, the distributions of time to advance have essentially the same shape and spread with the centers, or average time to be advanced, displaced by amounts ranging from -3 to 2 months. The only exception to the similar spread conclusion is the Marine Corps advancement from

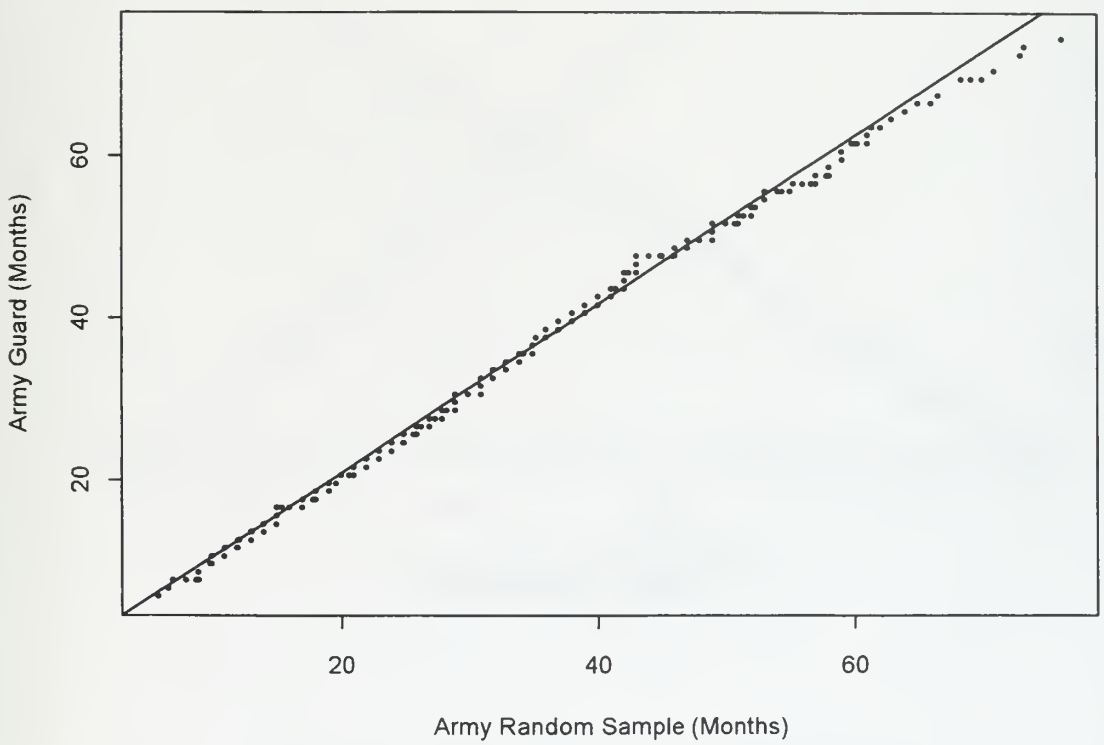
paygrade E3 to paygrade E4. The estimated slope of 0.89 indicates that, on the average, members of the Marine Barracks, Washington are advanced to paygrade E4 faster than their random sample counterparts.

Thus, other than Navy Ceremonial Guard and Marine Barracks, Washington members in paygrade E3, there is apparently no perceptible impact on a service member's career for time spent with a ceremonial unit.

F. AREAS OF FURTHER STUDY

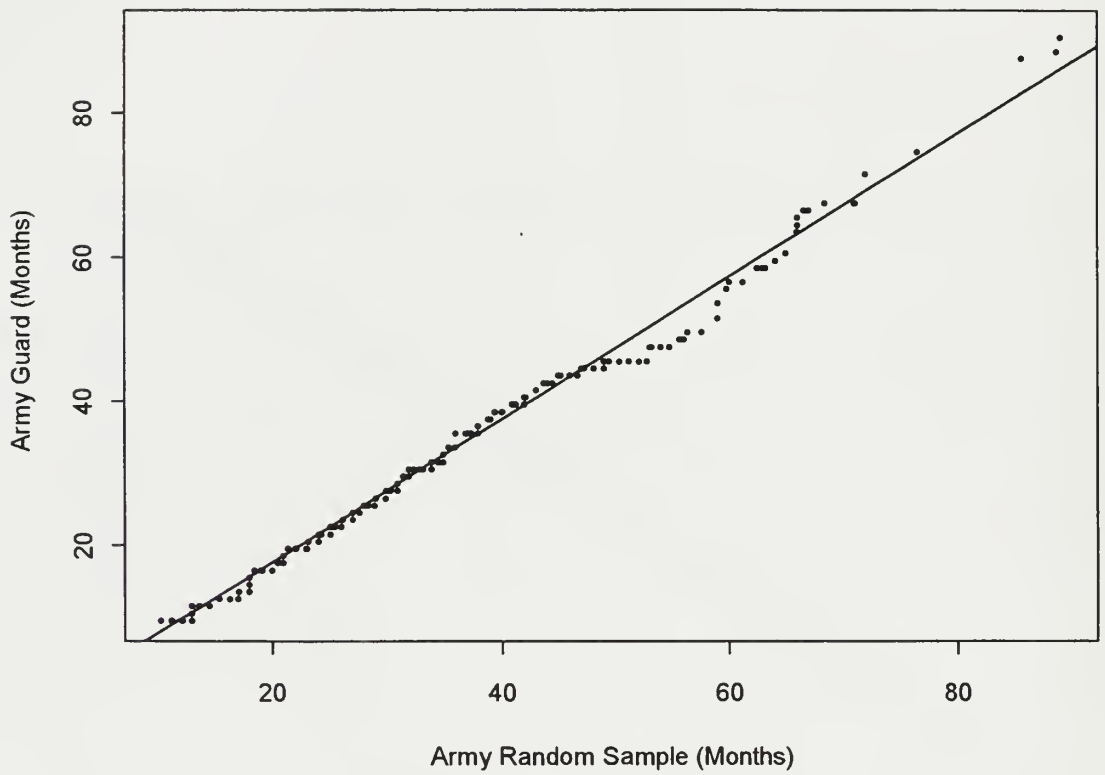
The Navy has recently installed additional leadership (E5 and above) for their Ceremonial Guard. This additional guidance may have an impact on the E3 members to counter the above results. Studying the same type of data several years from now may show elimination of the negative impact on this group. Additionally, the service members were not separated by gender or rating. A detailed study that included such breakdowns may provide additional information on the smaller groups. As the reasons for attrition were not known during this study, a determination and comparison of reasons for leaving the service may also be useful.

APPENDIX A. QUANTILE-QUANTILE PLOTS FOR ARMY ADVANCEMENT AND ATTRITION



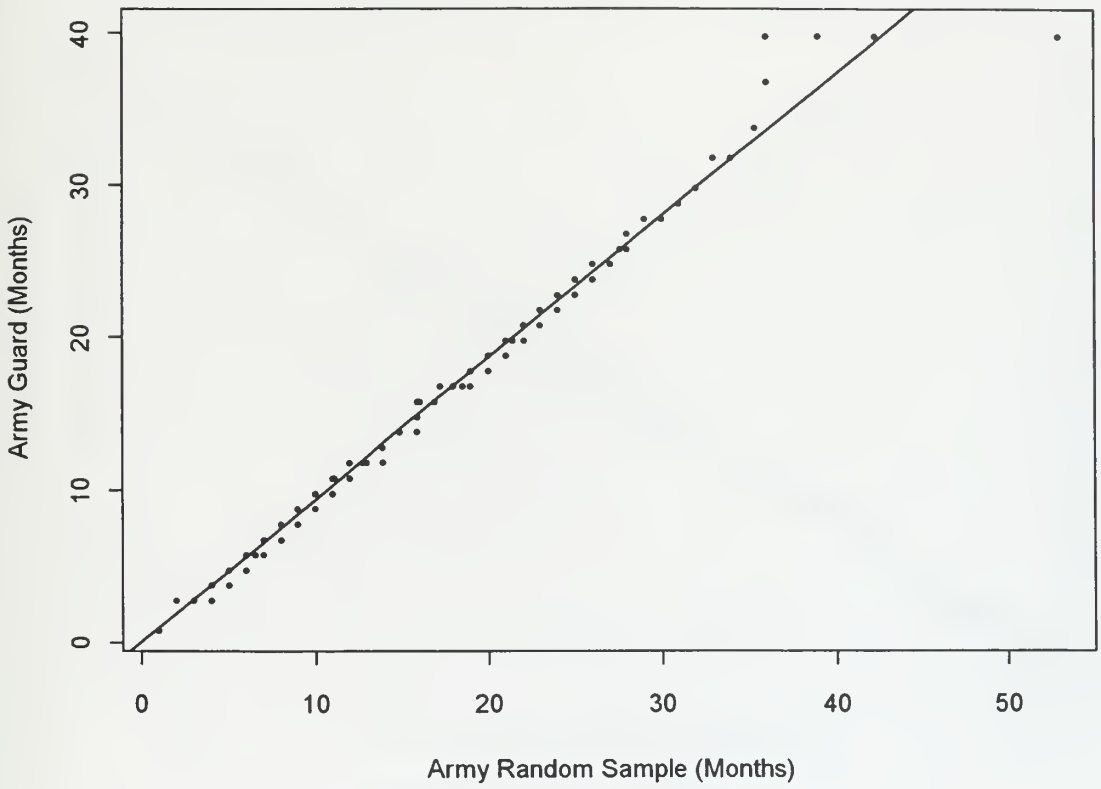
Army Time to Advance from Paygrade E4 to E5

Old Guard Sample Size:	737	Slope Estimate:	1.04
Random Sample Size:	1316	Y intercept Estimate:	0.07



Army Time to Advance from Paygrade E5 to E6

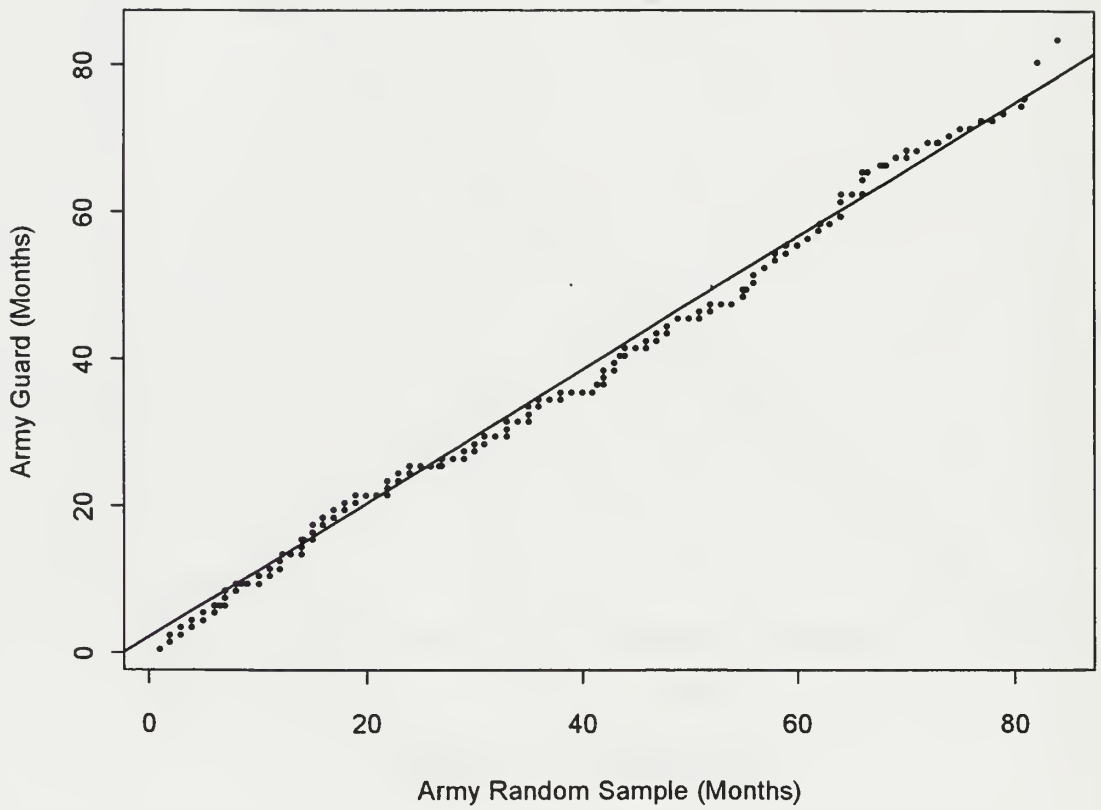
Old Guard Sample Size:	221	Slope Estimate:	0.99
Random Sample Size:	197	Y intercept Estimate:	-2.16



Army Time in Rate before Attrition from Paygrade E3

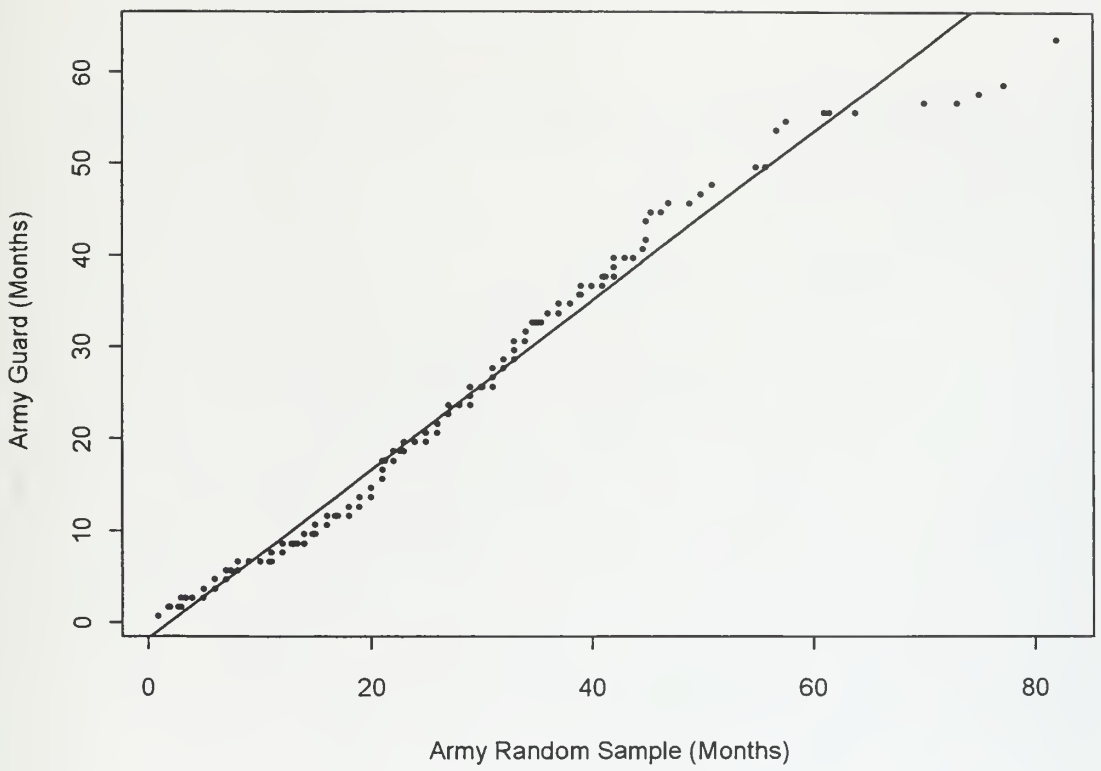
Old Guard Sample Size: 301
Random Sample Size: 1349

Slope Estimate: 0.93
Y intercept Estimate: 0.07



Army Time in Rate before Attrition from Paygrade E4

Old Guard Sample Size:	1305	Slope Estimate:	0.91
Random Sample Size:	4210	Y intercept Estimate:	2.19

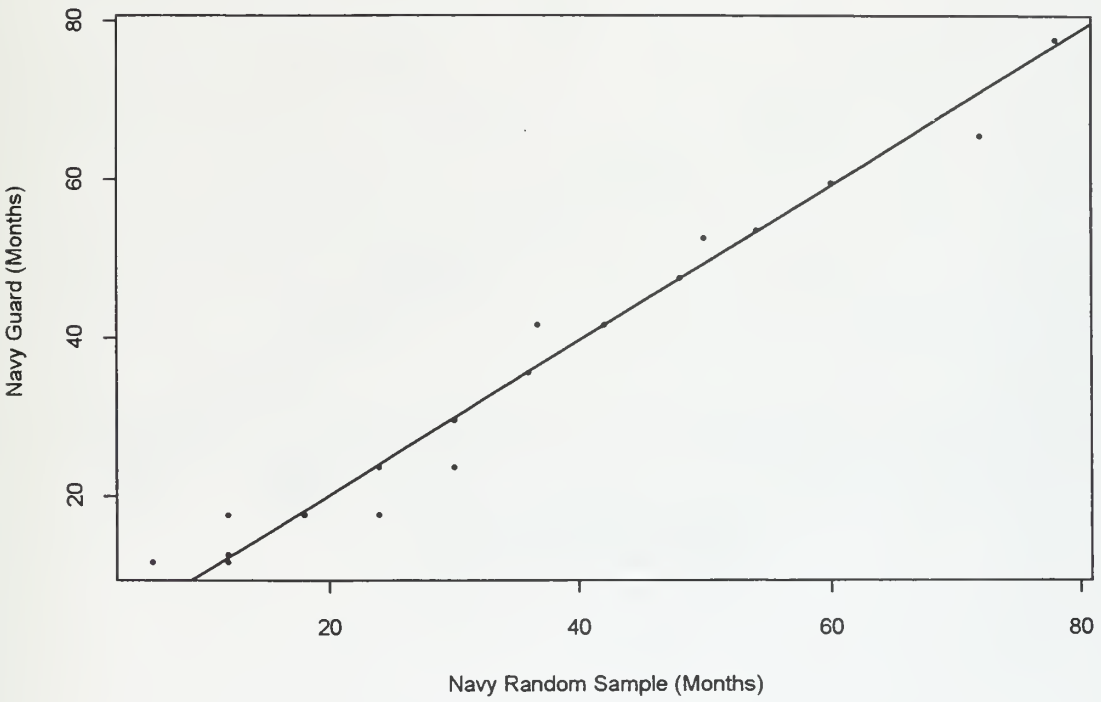


Army Time in Rate before Attrition from Paygrade E5

Old Guard Sample Size: 231
Random Sample Size: 445

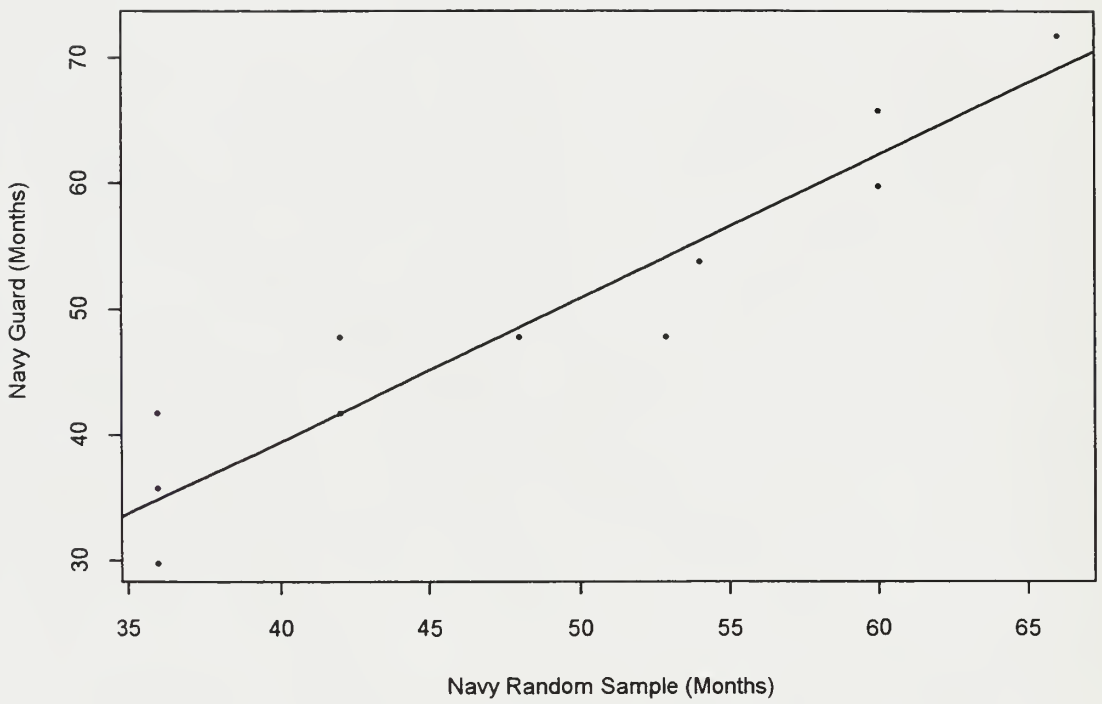
Slope Estimate: 0.92
Y intercept Estimate: -1.76

APPENDIX B. QUANTILE-QUANTILE PLOTS FOR NAVY ADVANCEMENT AND ATTRITION



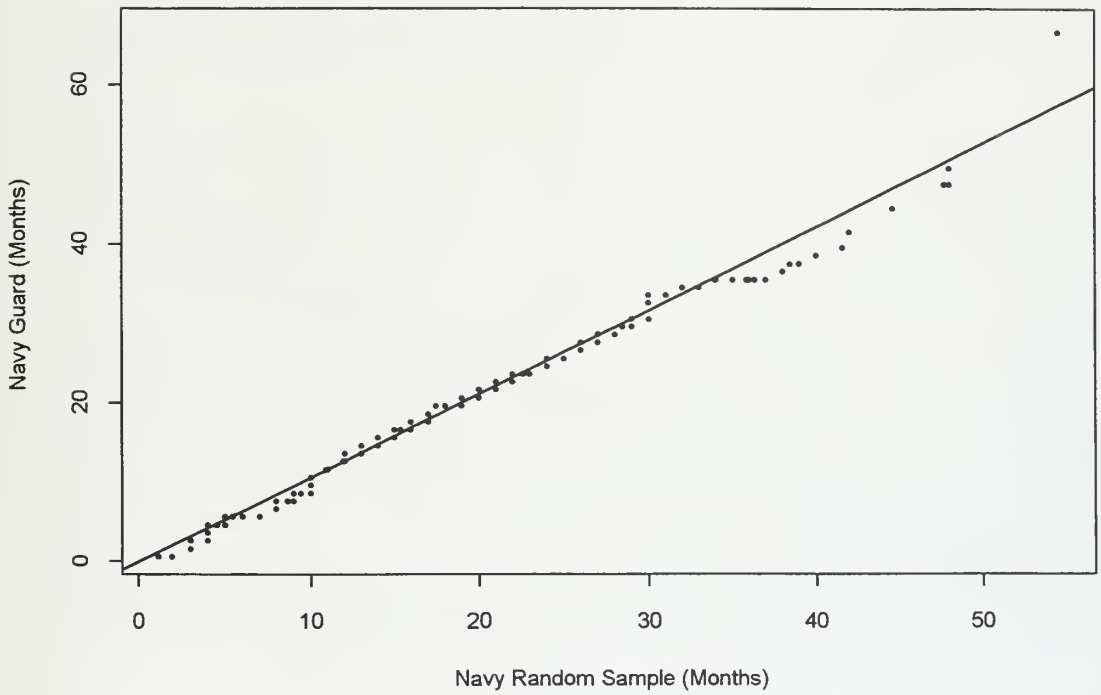
Navy Time to Advance from Paygrade E4 to E5

Ceremonial Guard Sample Size:	121	Slope Estimate:	0.98
Random Sample Size:	1805	Y Intercept Estimate:	0.51



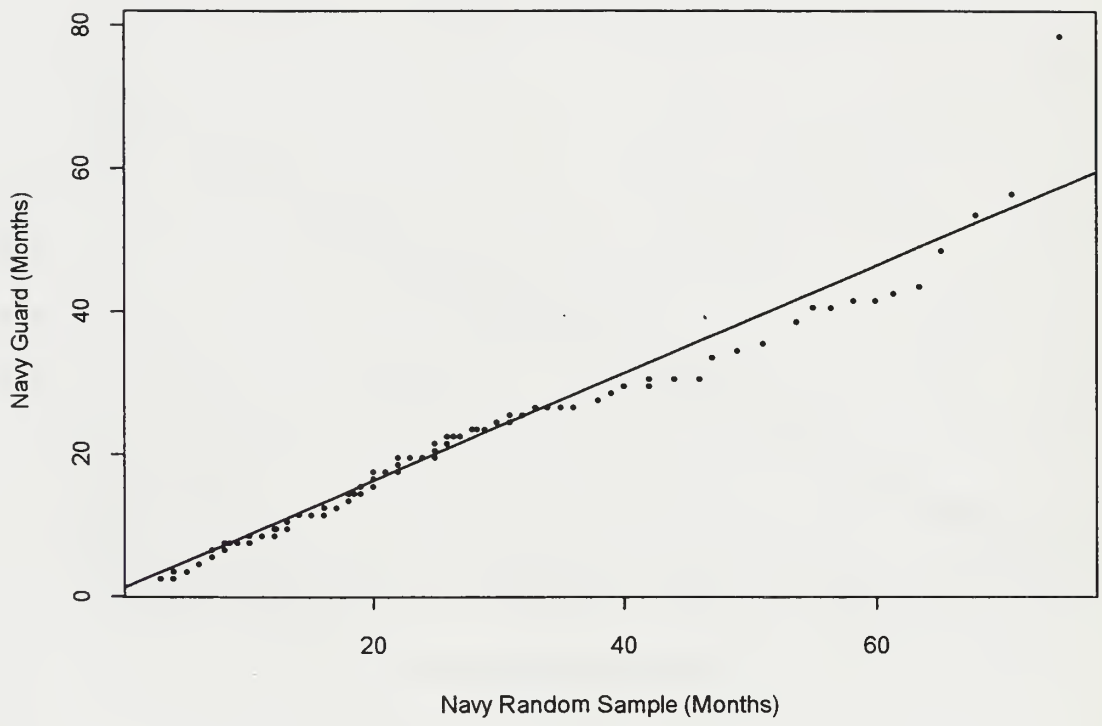
Navy Time to Advance from Paygrade E5 to E6

Ceremonial Guard Sample Size:	13	Slope Estimate:	1.14
Random Sample Size:	70	Y Intercept Estimate:	-6.28



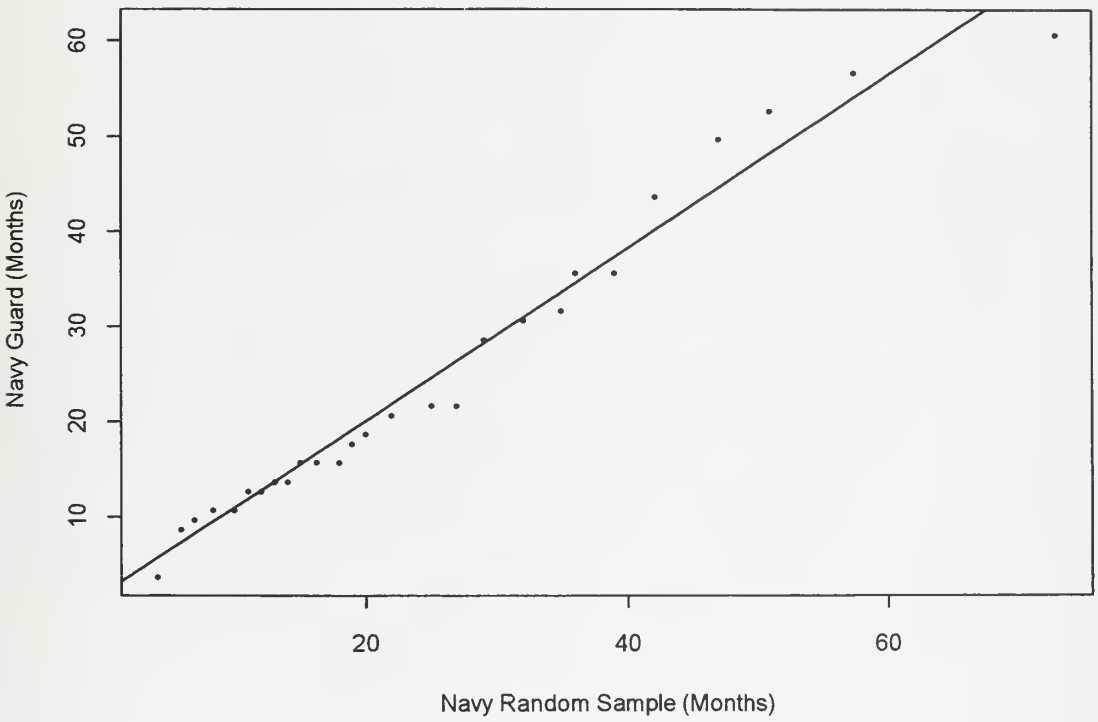
Navy Time in Rate before Attrition from Paygrade E3

Ceremonial Guard Sample Size:	283	Slope Estimate:	1.06
Random Sample Size:	673	Y Intercept Estimate:	-0.06



Navy Time in Rate before Attrition from Paygrade E4

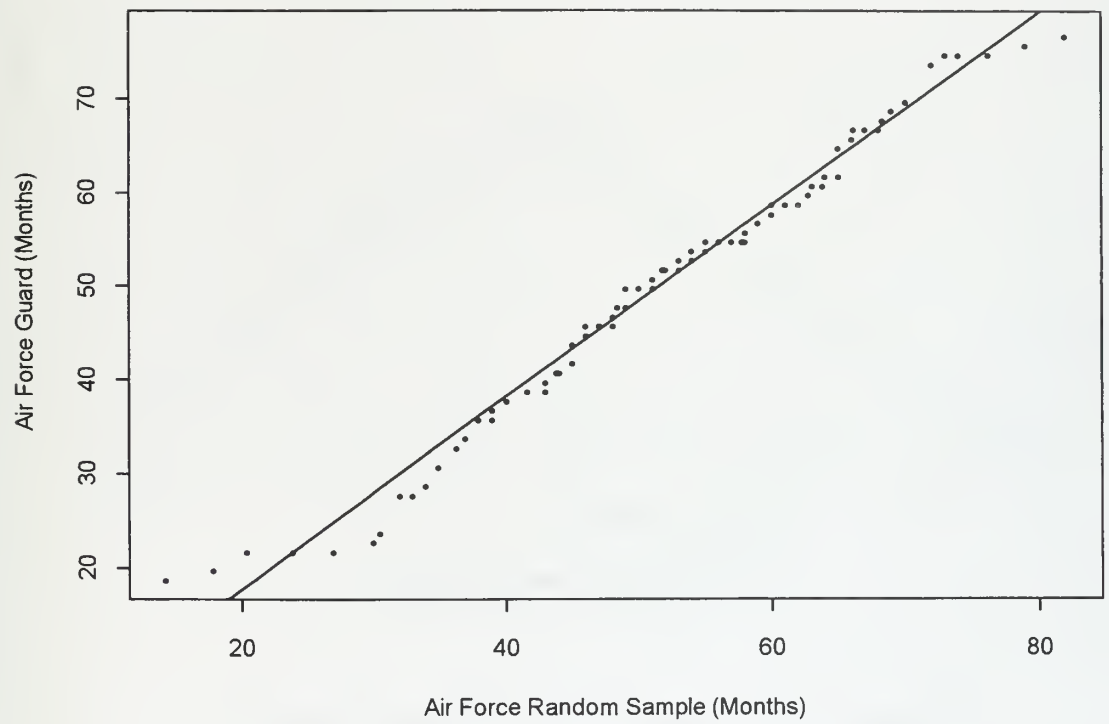
Ceremonial Guard Sample Size:	162	Slope Estimate:	0.76
Random Sample Size:	775	Y Intercept Estimate:	1.19



Navy Time in Rate before Attrition from Paygrade E5

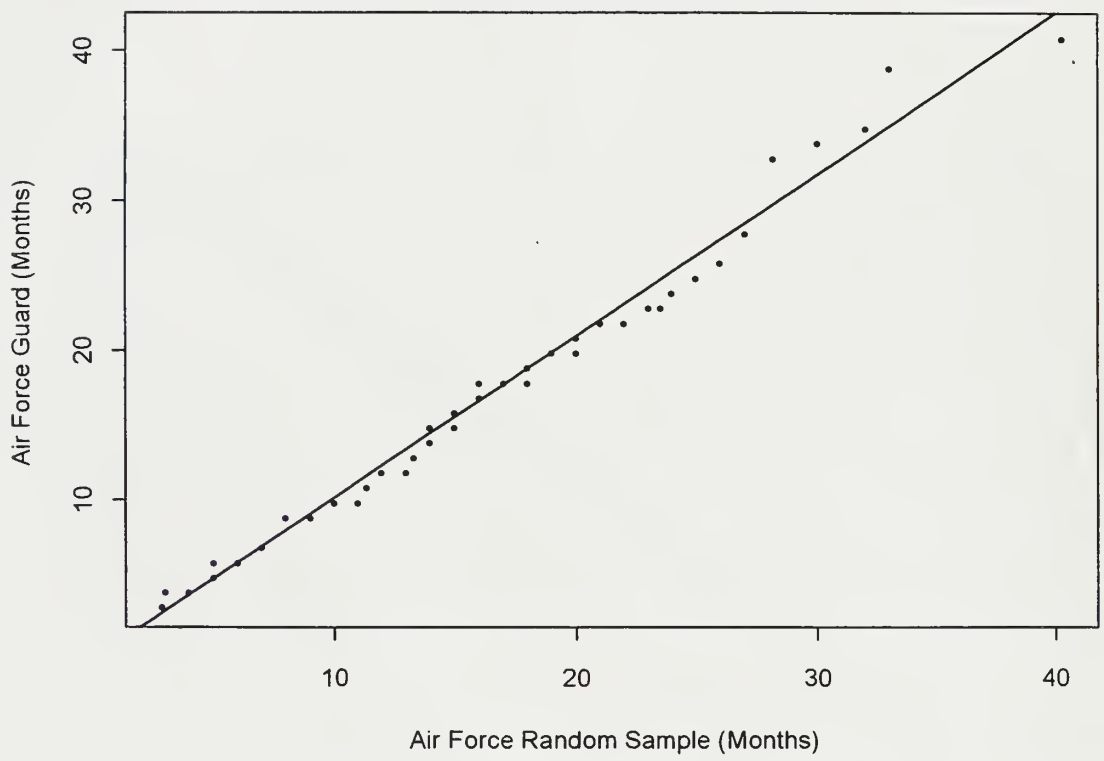
Ceremonial Guard Sample Size:	27	Slope Estimate:	0.91
Random Sample Size:	228	Y Intercept Estimate:	1.89

APPENDIX C. QUANTILE-QUANTILE PLOTS FOR AIR FORCE ADVANCEMENT AND ATTRITION



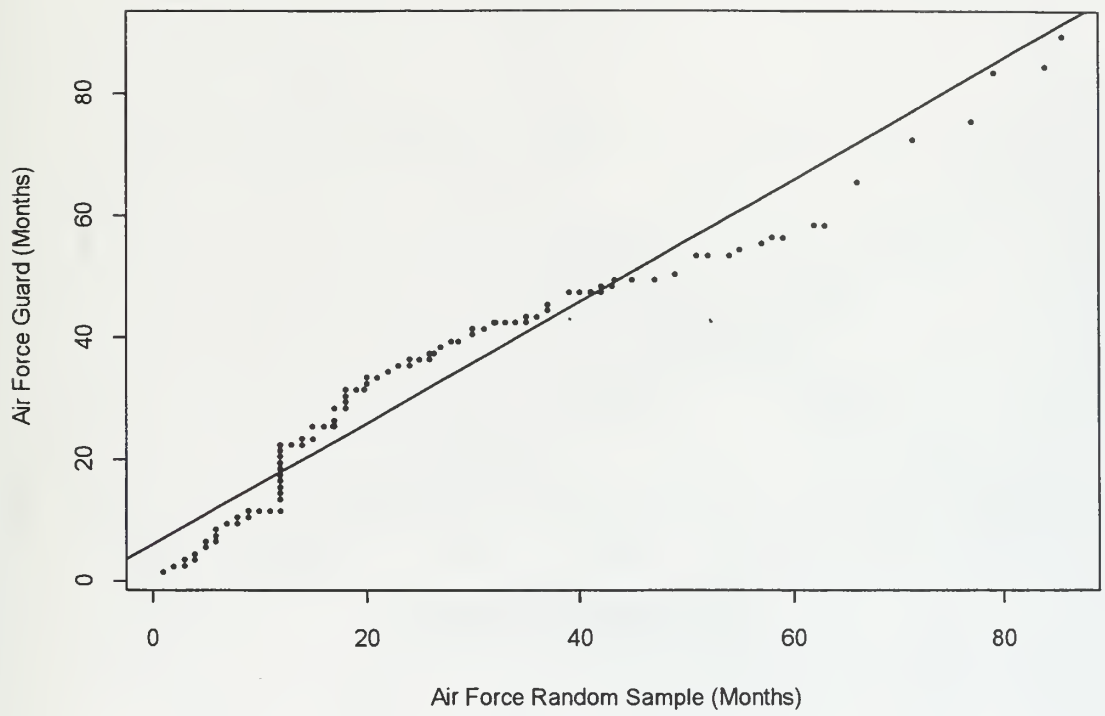
Air Force Time to Advance from Paygrade E4 to E5

Honor Guard Sample Size:	428	Slope Estimate:	1.02
Random Sample Size:	2549	Y intercept Estimate:	-2.76



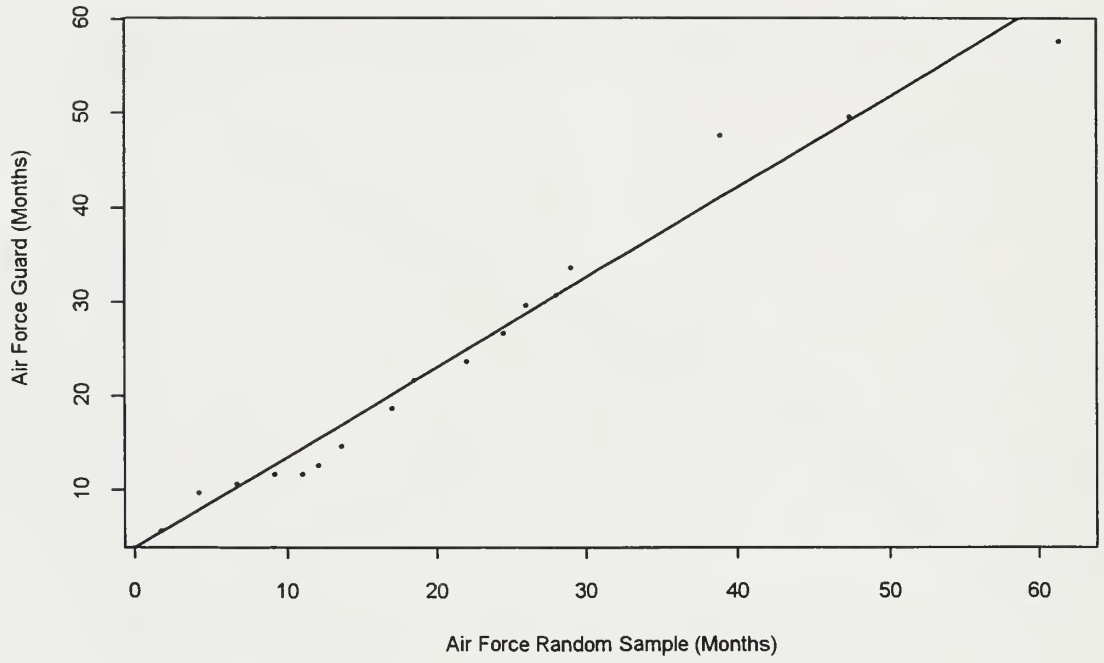
Air Force Time in Rate prior to Attrition from Paygrade E3

Honor Guard Sample Size:	53	Slope Estimate:	1.08
Random Sample Size:	517	Y intercept Estimate:	-0.62



Air Force Time in Rate prior to Attrition from Paygrade E4

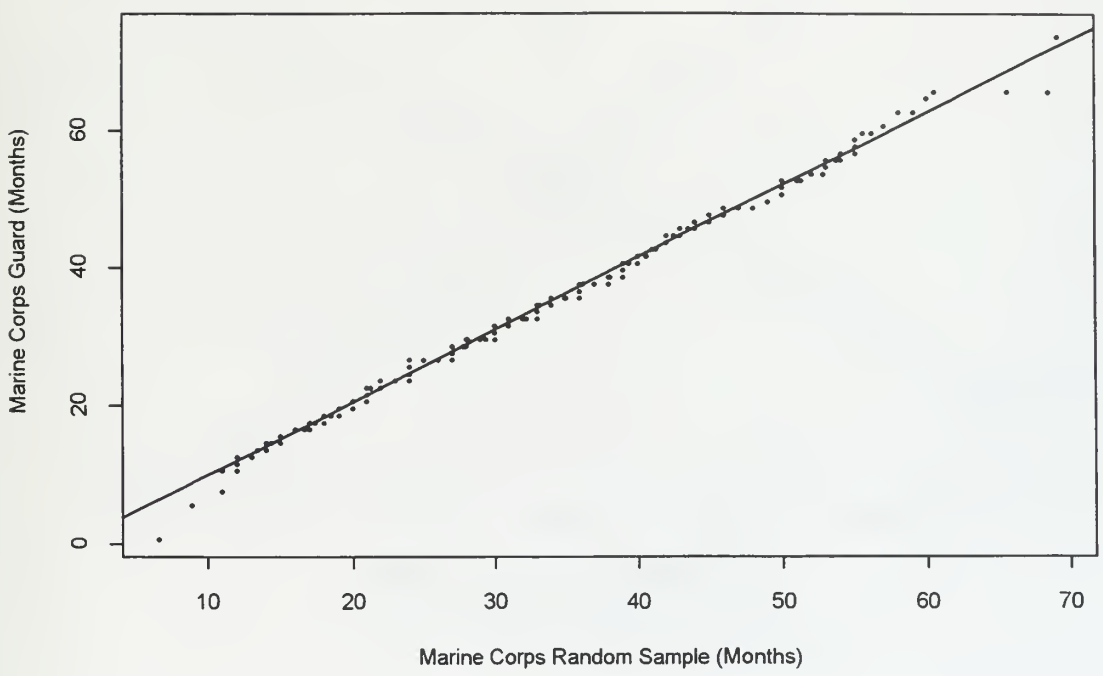
Honor Guard Sample Size:	181	Slope Estimate:	1.00
Random Sample Size:	1234	Y intercept Estimate:	5.61



Air Force Time in Rate prior to Attrition from Paygrade E5

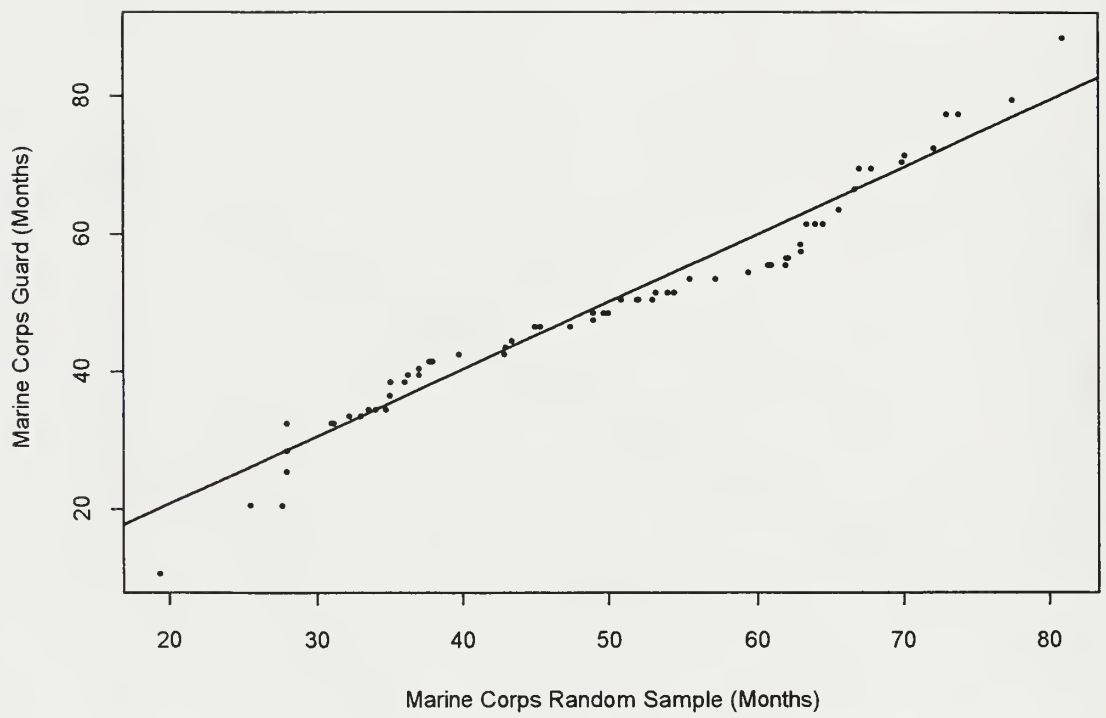
Honor Guard Sample Size:	17	Slope Estimate:	0.96
Random Sample Size:	59	Y intercept Estimate:	3.94

APPENDIX D. QUANTILE-QUANTILE PLOTS FOR MARINE CORPS ADVANCEMENT AND ATTRITION



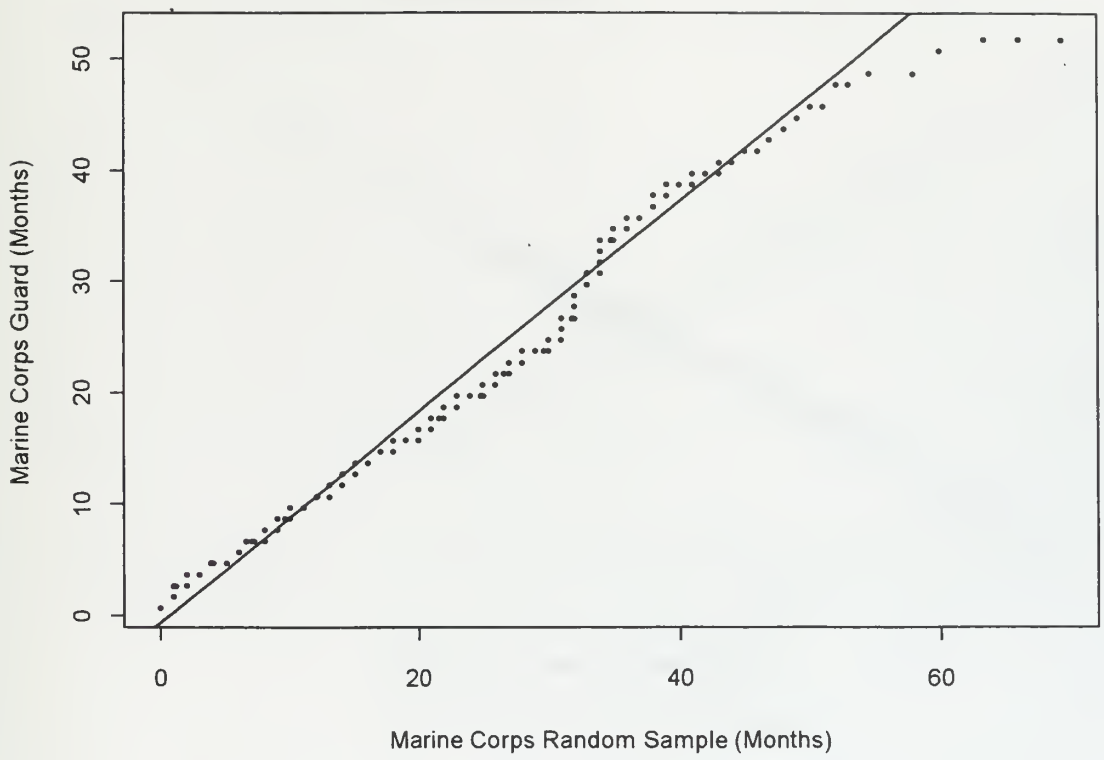
Marine Corps Time to Advance From Paygrade E4 to E5

Marine Barracks, Washington Sample Size:	677	Slope Estimate:	1.05
Random Sample Size:	1106	Y Intercept Estimate:	-0.52



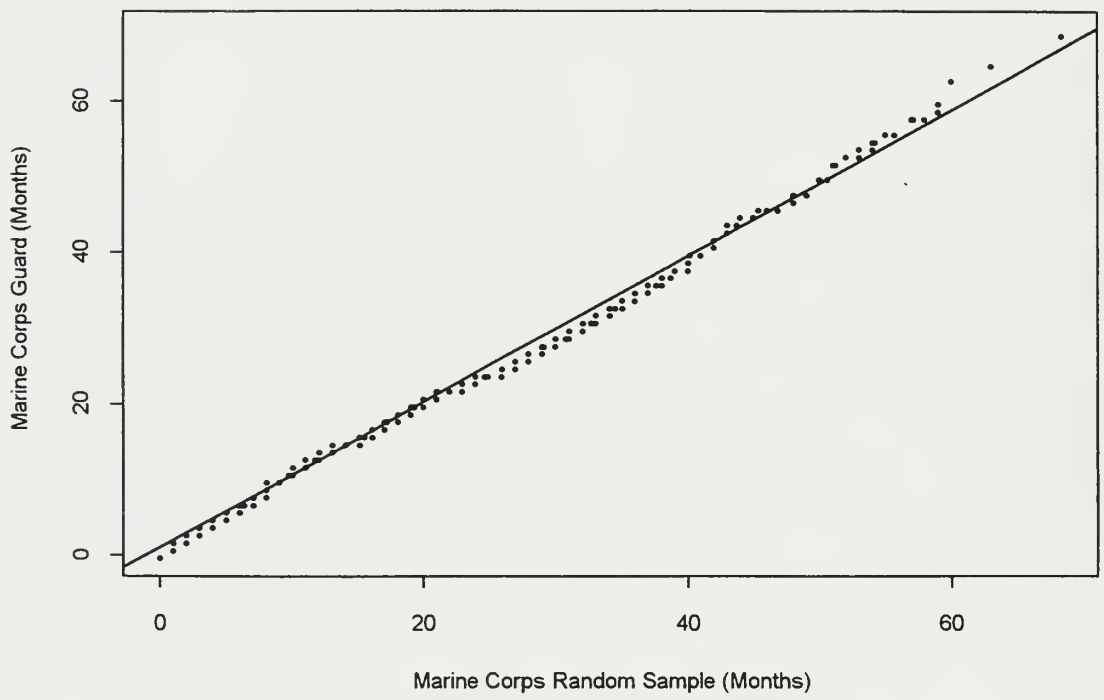
Marine Corps Time to Advance from Paygrade E5 to E6

Marine Barracks, Washington Sample Size:	72	Slope Estimate:	0.98
Random Sample Size:	79	Y Intercept Estimate:	1.26



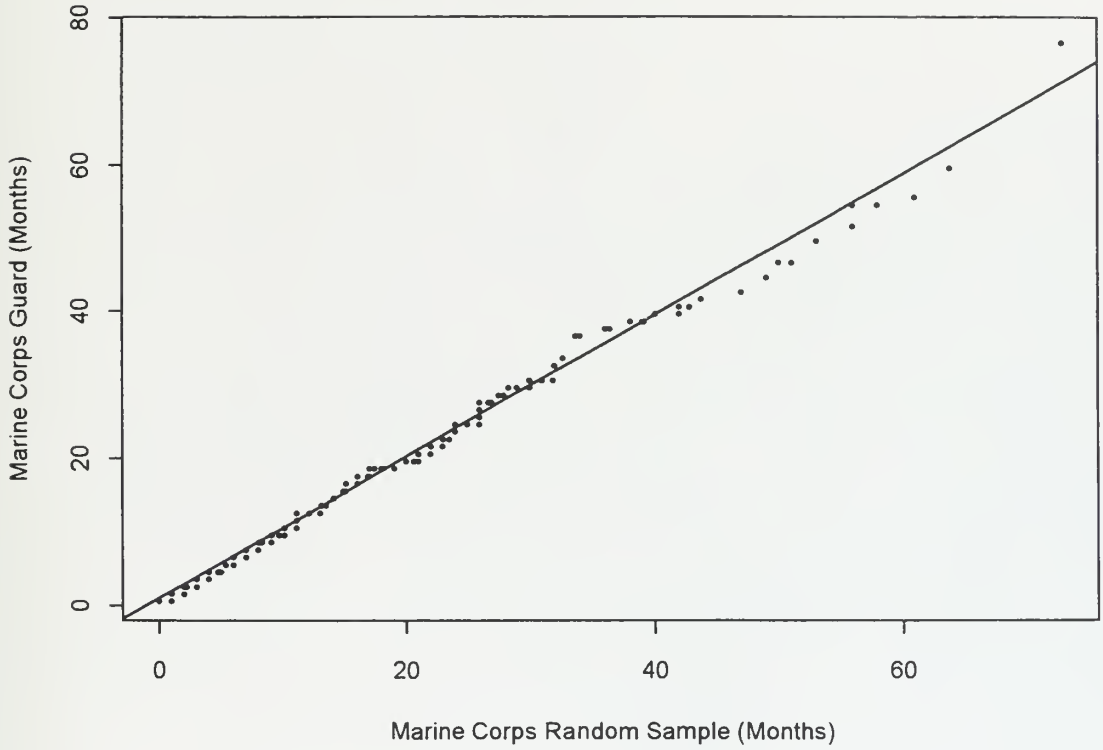
Marine Corps Time in Rate before Attrition from Paygrade E3

Marine Barracks, Washington Sample Size:	587	Slope Estimate:	0.95
Random Sample Size:	2266	Y Intercept Estimate:	-0.61



Marine Corps Time in Rate before Attrition from Paygrade E4

Marine Barracks, Washington Sample Size:	1261	Slope Estimate:	0.96
Random Sample Size:	2798	Y Intercept Estimate:	1.09



Marine Corps Time in Rate before Attrition from Paygrade E5

Marine Barracks, Washington Sample Size:	218	Slope Estimate:	0.96
Random Sample Size:	422	Y Intercept Estimate:	1.03

LIST OF REFERENCES

Hamilton, L. C., Regression with Graphics: A Second Course in Applied Statistics, Wadsworth, Inc., 1992.

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